EVALUATION OF SEQUENTIAL PRESENTATION WITHOUT EXTINCTION FOR THE TREATMENT OF FOOD SELECTIVITY

By

Jessica F. Juanico

Submitted to the graduate degree program in The Department of Applied Behavioral Science and the Graduate Faculty of the University of Kansas in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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Chair: Claudia L. Dozier, Ph.D.

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Vincent T. Francisco, Ph.D.

_____

David P. Jarmolowicz, Ph.D.

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Pamela L. Neidert, Ph.D.

_____

Jason C. Travers, Ph.D.

Date Defended: 28 July 2017

The Dissertation Committee for Jessica F. Juanico
certifies that this is the approved version of the following dissertation:

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Chair: Claudia L. Dozier, Ph.D.

Date approved: 28 July 2017

Abstract

Sequential presentation (i.e., differential reinforcement of alternative behavior) is a widely used procedure to increase consumption of non-preferred foods in children with food selectivity (e.g., Allison et al., 2012; Anderson & McMillan, 2001; Kern & Marder, 1996; Najdowski, Wallace, Doney, & Ghezzi, 2003). Escape extinction is often a critical component of sequential presentation. However, there are challenges associated with its implementation such as extinction bursts and extinction-induced response variability (Ahearn, Kerwin, Eicher, Shantz, & Swearingin, 1996; Sevin, Gulotta, Sierp, Rosica, & Miller, 2002). These challenges may make sequential presentation difficult to implement under certain situations, specifically for caregivers (e.g., McConnachie & Carr, 1997). Therefore, it is important to evaluate the effects of procedures in the absence of escape extinction (Kodak & Piazza, 2008; Penrod, Wallace, Reagon, Betz, & Higbee, 2010). Thus, the purpose of the current study was to evaluate the effects of sequential presentation without escape extinction under various conditions. First, we compared the effects of three sequential presentation procedures using various stimuli (i.e., preferred food, preferred tangible, preferred attention). If those sequential presentation procedures were ineffective, we evaluated the effects of a sequential presentation procedure in which we combined the three preferred stimuli. If the sequential presentation procedure with combined stimuli was ineffective, then we evaluated the effects of a sequential presentation procedure in which the duration of access to the combined stimuli was increased. Results suggest the delivery of a single stimulus was effective for three of eight participants, the combination of stimuli was effective for three of six participants with whom we evaluated this procedure, and escape EXT was necessary for two participants.

Keywords: food selectivity, escape extinction, sequential presentation, parameters of reinforcement, children

Acknowledgements

To my husband and family, thank you for putting up with me throughout graduate school and the dissertation process. I appreciate all of your encouragement and endless support along the way. To my lab mates, past and present, thank you for being my support day in and day out. I could not have done graduate school without each one of you. To my current lab mates, thank you for all of the hard work that you put into this project by conducting sessions, editing protocols, and listening to me present this project for the past year and a half. To my graduate school co-pilot, Kelley Harrison, I could not have done this without you and thank you cannot begin to describe my gratitude for you. To my dissertation committee, Drs. Claudia Dozier, Florence DiGennaro Reed, Vincent Francisco, David Jarmolowicz, Pamela Neidert, and Jason Travers, thank you for your time and insightful suggestions regarding this study. Finally, to my advisor, Dr. Claudia Dozier, thank you for taking a risk on me 5 years ago. I cannot express how thankful I am to have worked and learned from you. Thank you for the countless hours that you have spent on my documents and your guidance and support throughout the years. I am extremely proud to be a part of the Dozier Lab. If I had the opportunity to do it all again, I would still choose you!

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Evaluation of Sequential Presentation without Extinction for the Treatment of Food Selectivity

Feeding problems are a common concern for parents of young children and can range from total food refusal to food selectivity (Babbitt, Hoch, & Coe, 1994; Burklow, Phelps, Schultz, McConnell, & Rudolph, 1998; Ledford & Gast, 2006; Palmer & Horn, 1978; Silbaugh et al., 2016). Food selectivity or "picky eating" is the most common feeding problem (Field, Garland, & Williams, 2003; Kedesdy & Budd, 1998; Silbaugh et al., 2016), which has been reported to occur in 10% to 35% of typically developing children (Burklow et al., 1998; Manikam & Perman, 2000) and up to 70% of children with an autism spectrum disorder (ASD) who have a feeding problem (Twachtman-Reilly, Amaral, & Zebrowski, 2008).

Food selectivity is often defined as the consumption of a limited variety of food that is typically nutritionally inappropriate and categorized according to the type of selectivity (Field et al., 2003; Silbaugh et al., 2016). That is, children may be selective with respect to type, texture, temperature, color, and the vehicle of food presentation (Bandini et al., 2010; Gentry & Luiselli, 2008; Munk & Repp, 1994; Piazza, 2008; Wilkins et al., 2014; Williams & Seiverling, 2010). A child who is type selective accepts foods from some food groups but not others. For example, a type selective child accepts only grains but not fruits or vegetables. A type selective child may be at risk for nutritional deficiencies due to the limited variety of food intake. A child who is texture selective accepts foods from specific textures but not others. For example, a texture selective child accepts only pureed foods but not coarser foods. Texture selectivity may be a by-product of a skill deficit in that the child has not developed oral motor skills necessary to chew coarser textures. A child who is temperature selective will only accept food at a specific temperature (e.g., hot). A child who is color selective will only accept specific colored foods

(e.g., orange foods). A child who is vehicle selective will only accept food when caregivers present it a specific way (e.g., with a spoon but not a fork). Because of the nature of food selectivity (i.e., consumption of some foods but not others), there are associated risks and challenges for both the child and caregiver (Munk & Repp, 1994; Patel, 2013).

Challenges and Risks Associated with Food Selectivity

The U.S. Department of Health and Human Services and the U.S. Department of Agriculture (2015) recommended specific guidelines for a healthy diet, which include eating a variety of foods (i.e., grains, vegetables, fruits, dairy, and protein) to maintain a healthy diet and obtain the vitamins, minerals, and fiber needed daily. Furthermore, guidelines suggest that sugar, saturated fats, and sodium should be limited. Given that children with food selectivity often have a restricted food repertoire (i.e., consumption of specific foods but not others), they are at a greater risk for nutritional deficiencies than their typical counterparts (e.g., Bandini et al., 2010; Zimmer et al., 2012), particularly when they only accept unhealthy foods with high levels of fat and sugar. Unfortunately, restricted food consumption may place children at greater risk for medical complications such as malnutrition, dehydration, and failure to grow (Kodak & Piazza, 2008; Linscheid, 2006; Piazza, 2008).

Children with food selectivity also may engage in ritualistic mealtime behaviors that involve placing demands on caregivers for specific utensils, seating arrangements, or meal presentations (Johnson et al., 2014; Marquenie, Rodger, Mangohig, & Cronin, 2011). In addition, they may engage in challenging behavior such as turning away from food presentation, self-injurious behavior, vomiting, or emotional responding (e.g., Lewinshon et al., 2005; Penrod, Gardella, & Fernand, 2012; Penrod, Wallace, Reagon, Betz, & Higbee, 2010) to escape or avoid the mealtime context or presentation of certain foods (Piazza, 2008). These ritualistic and

disruptive mealtime behaviors are often associated with increased parental stress that result in parents making accommodations for their child (e.g., Greer, Gulotta, Masler, & Laud, 2008). These accommodations likely make meals more difficult for the caregivers in that they create extra work (Marquenie et al., 2011), but the accommodations also likely reinforce the selective eating and disruptive behavior of the children (e.g., Borrero, Woods, Borrero, Masler, & Lesser, 2010).

Treatment of Food Selectivity

Prior to the start of treatment, clinicians and researchers often conduct assessments to determine the conditions under which food selectivity does and does not occur. Results of both descriptive assessments (e.g., Borrero et al., 2010; McDowell, Duffy, & Kerr, 2007; Piazza et al., 2003) and functional analyses (e.g., Bachmeyer et al., 2009; Najdowski, Wallace, Doney, & Ghezzi, 2003; Piazza et al., 2003) have demonstrated that socially mediated consequences, particularly social negative reinforcement, play a large role in the development and maintenance of feeding problems. For example, Borrero et al. (2010) measured the consequences that caregivers provided contingent on refusal and disruptive mealtime behavior with 25 children, ages 1 to 8, with total food refusal or food selectivity. All caregivers removed the utensil (i.e., provided escape) and 24 of the 25 caregivers delivered attention contingent on refusal. Piazza et al. (2003) found similar results with six children in that all caregivers removed food and provided attention (i.e., reprimands, soothing comments, coaxing) contingent on disruptive mealtime behavior. Thus, the data from descriptive assessments suggest that both social positive and social negative reinforcement may play some role in the development and maintenance of feeding problems.

Furthermore, the results of functional analyses suggest that social negative reinforcement in the form of escape often maintains feeding problems. For example, Najdowski et al. (2008) conducted functional analyses on the disruptive mealtime behavior (e.g., expulsion, negative vocalizations, gagging) of six children, ages 2 to 4, with food selectivity. For all six participants, social negative reinforcement in the form of escape was demonstrated to maintain their disruptive mealtime behavior. Some studies have suggested that social positive reinforcement, in combination with social negative reinforcement, also maintains feeding problems (e.g., Piazza et al., 2003). Given that food selectivity is often maintained by negative reinforcement in the form of escape from or avoidance of food presentation (e.g., Piazza et al., 2003; Najdowski et al., 2003), most treatments for food selectivity have included escape extinction (EXT; e.g., Cooper et al., 1999; Najdowski et al., 2003; Penrod et al., 2010).

Escape EXT. Escape EXT involves preventing a child from accessing escape (i.e., removal of an aversive stimulus) or preventing a child from avoiding an aversive stimulus (Kodak & Piazza, 2008; Piazza et al., 2003; Piazza, 2008). In the treatment of feeding problems, clinicians and researchers have implemented escape EXT using physical guidance, nonremoval of the spoon, or a combination of the two (e.g., Ahearn, Kerwin, Eicher, Shantz, & Swearingin, 1996). Physical guidance involves the therapist applying gentle pressure to the child's mandibular joint (i.e., jaw) contingent on refusal (e.g., Ahearn et al., 1996) to open the child's mouth such that the therapist can deposit the food. Oftentimes clinicians and researchers implement physical guidance in conjunction with nonremoval of the spoon. Nonremoval of the spoon involves the therapist placing the spoon at the child's mouth until the child accepts the food or until the therapist deposits the food in the child's mouth (e.g., Sevin, Gulotta, Sierp, Rosica, & Miller, 2002). Additional procedures that may function as escape EXT in the

treatment of food selectivity include re-presentation (e.g., Piazza et al., 2002; Sharp, Jaquess, Bogard, & Morton, 2010) and redistribution (e.g., Gulotta, Piazza, Patel, & Layer, 2005; Sevin et al., 2002). Clinicians and researchers have implemented re-presentation for expulsion (i.e., food previously inside the mouth that exits the mouth) in which the therapist presents another bite of the same food contingent on expulsion (e.g., Sevin et al., 2002; Sharp et al., 2010). Clinicians and researchers have implemented redistribution for packing (i.e., holding food in the mouth) in which the therapist removes the packed food and deposits it on the tongue in an attempt to facilitate consumption (e.g., Gulotta et al., 2005).

Although a few studies have demonstrated the efficacy of escape EXT in isolation for treating food selectivity (e.g. Bachmeyer et al., 2009; LaRue et al., 2011; Wilkins et al., 2014), escape EXT is often used in combination with antecedent and other consequent interventions for treating food selectivity (e.g., Ahearn et al., 1996; Cooper et al., 1995; Kern & Marder, 1996; Riordan, Iwata, Finney, Wohl, & Stanley, 1984). In fact, several studies have shown the necessity of escape EXT for treating food selectivity (e.g., Cooper et al., 1995; Piazza et al., 2002; Najdowski et al., 2003; VanDalen & Penrod, 2010). Cooper et al. (1995) conducted a component analysis with a 1-year-old boy diagnosed with failure to thrive and language delays who was overly selective (i.e., accepted bites from one specific food group at low levels) to determine the treatment component (i.e., sequential presentation or escape EXT) most necessary for behavior change. During baseline, nursing staff conducted sessions and the experimenters delivered no instructions as how to conduct the session. During sequential presentation (i.e., reinforcer delivered contingent upon acceptance of non-preferred food) and escape EXT, the experimenter delivered praise and a preferred food or drink contingent on acceptance and implemented nonremoval of the spoon and re-presentation contingent on refusal and expulsion.

Next, the experimenter removed escape EXT to determine whether escape EXT was necessary for maintaining acceptance. The results suggested that sequential presentation and escape EXT were effective for increasing acceptance; however, escape EXT was necessary for the maintenance of acceptance. Similarly, VanDalen and Penrod (2010) found that increases in the percentage of bites consumed increased when and only when the experimenters implemented escape EXT (i.e., nonremoval of the spoon) for two young boys who were diagnosed with ASD and displayed food selectivity (i.e., consistently accepted a small number of solid foods). The data from other studies (e.g., Piazza et al., 2002) also suggest that escape EXT is a procedure that is often necessary for changes in and maintenance of feeding behaviors.

Because food selectivity is likely maintained by social negative reinforcement, most treatments have included escape EXT to prevent and reduce the likelihood of escape from bite presentation. Numerous studies have shown that various procedures, when combined with escape EXT, have been effective for the treatment of food selectivity (e.g., Cooper et al., 1995; Cooper et al., 1999; Freeman & Piazza, 1998; Kern & Marder, 1996).

Sequential presentation with escape EXT. A procedure that is often implemented in combination with escape EXT is sequential presentation (e.g., Ahearn et al., 1996; Cooper et al., 1995; Najdowski et al., 2003; Penrod et al., 2010; Riordan et al., 1984). Sequential presentation involves the therapist placing a spoon with a non-preferred food at the participant's mouth or a plate of non-preferred food in front of the participant (Linscheid, 2006). Contingent upon acceptance of the non-preferred food, the therapist typically delivers brief praise in conjunction with access to a high-preferred food item (e.g., Anderson & McMillan, 2001; Kern & Marder, 1996), access to a high-preferred tangible item (e.g., Ahearn et al., 1996; Murphy & Zlomke,

2016), access to meal termination (e.g., Freeman & Piazza, 1998), or access to a combination of reinforcers (e.g., Fu et al., 2015; Riordan et al., 1984).

Several studies have implemented sequential presentation in combination with escape EXT (e.g., Allison et al., 2012; Anderson & McMillan, 2001; Kern & Marder, 1996; Shore, Babbitt, Williams, Coe, & Snyder, 1998). Kern and Marder (1996) compared the effects of simultaneous presentation with escape EXT and sequential presentation with escape EXT on food selectivity of a 7-year-old boy diagnosed with pervasive developmental disorder. At the start of the study, the participant accepted preferred food but refused non-preferred food. During baseline, the experimenter presented a bite of food in front of the participant for 30 s. If the participant refused (i.e., did not accept) the food for 30 s, then the experimenter removed the food and presented the next food. During both interventions, if the participant refused the food following presentation, then the experimenter implemented escape EXT (i.e., nonremoval of the spoon). If the participant expelled the food, then the experimenter re-presented the same bite. During simultaneous presentation with escape EXT, the experimenter presented the non-preferred food on top of the high-preferred food (i.e., chip). During sequential presentation with escape EXT, the experimenter presented the food and delivered the high-preferred food (i.e., chip) contingent upon acceptance. Results demonstrated that both interventions were effective for increasing acceptance of non-preferred food; however, it is unclear which procedures were responsible for increases in acceptance. That is, given the experimenters implemented escape EXT with both procedures, it is unclear which procedures were necessary or sufficient for behavior change.

Several studies have demonstrated that sequential presentation is ineffective in the absence of escape EXT for some participants (e.g., Ahearn et al., 1996; Najdowski et al., 2003;

Najdowski et al., 2010; Penrod et al., 2010; VanDalen & Penrod, 2010). Najdowski et al. (2010) evaluated the effects of training parents to implement sequential presentation and demand fading with and without escape EXT (i.e., nonremoval of the spoon) for increasing acceptance of non-preferred foods in three children, ages 2 to 4, with food selectivity (i.e., participants accepted at least nine foods consistently). Two children were diagnosed with ASD, and one child was typically developing. First, during sequential presentation, the parent delivered praise and a high-preferred food contingent on acceptance and escape from bite presentation contingent on refusal and disruptive mealtime behavior. Next, the parent implemented sequential presentation, escape EXT (i.e., nonremoval of the spoon and re-presentation), and demand fading. Across all participants, the addition of escape EXT and demand fading were necessary to increase acceptance, which suggested that sequential presentation in the absence of escape EXT and demand fading was ineffective for increasing acceptance. In another study, VanDalen and Penrod (2010) compared the effects of sequential presentation and simultaneous presentation on consumption of non-preferred foods for two boys, ages 4 and 5, who were diagnosed with ASD and displayed food selectivity (i.e., consistently accepted a small number of solid foods). For both participants, consumption of non-preferred foods increased when and only when the experimenter implemented escape EXT (i.e., nonremoval of the spoon), suggesting the necessity of escape EXT in the treatment of food selectivity.

Challenges and risks associated with escape EXT. Although sequential presentation with escape EXT has been demonstrated to be effective, there are numerous challenges and risks associated with the use of escape EXT that may make the procedures difficult or dangerous to implement. These challenges and risks include EXT bursts (e.g., Azrin, Hutchinson, & Hake, 1966; Zarcone, Iwata, Hughes, & Vollmer, 1993), EXT-induced aggression (e.g., Azrin et al.,

1966; Todd, Morris, & Fenza, 1989), EXT-induced emotional behavior (e.g., Cowdery, Iwata, & Pace, 1990; Lerman & Iwata, 1996), and EXT-induced response variability (e.g., Ahearn et al., 1996; Goh & Iwata, 1994).

Extinction bursts are an initial and temporary increase in responding following the discontinuation of reinforcement (e.g., Azrin et al., 1966; Carr, Newsom, & Binkoff, 1980; Iwata, Pace, Kalsher, Cowdery, & Cataldo, 1990; Zarcone et al., 1993). For example, if disruptive mealtime behavior (e.g., negative vocalizations, aggression, self-injurious behavior) previously resulted in escape from food presentation, then following the implementation of escape EXT (e.g., nonremoval of the spoon), in which escape is no longer provided contingent upon disruptive mealtime behavior, the participant may engage in increased disruptive mealtime behavior to access escape. Although EXT bursts have not necessarily been studied in the feeding literature, there are data to suggest that following the implementation of escape EXT, there is a temporary increase in responding for some participants with food selectivity (i.e., Ahearn et al., 1996; Allison et al., 2012; Anderson & McMillan, 2001; Sharp et al., 2010). For example, Ahearn et al. (1996) compared the effects of physical guidance and nonremoval of the spoon following a history of sequential presentation without escape EXT. Following the implementation of escape EXT, data for one participant demonstrated an initial increase in disruptive mealtime behavior. That is, when the experimenter delivered escape for refusal during baseline, the participant engaged in initially high levels of disruptive mealtime behavior (i.e., negative vocalizations, disruptions, self-injurious behavior). However, following four sessions, disruptive mealtime behavior decreased to low levels. Next, when the experimenter implemented escape EXT for refusal, the participant engaged in high levels of disruptive mealtime behavior for the first three sessions of nonremoval of the spoon and the first session of

physical guidance; however, across sessions, the participant engaged in lower levels of disruptive mealtime behavior. Similar to the pattern of responding in Ahearn et al. in which a temporary increase in responding was observed following the implementation of escape EXT, other studies have also observed this effect with expulsion, interruptions, negative vocalizations, and self-injurious behavior (e.g., Allison et al., 2012; Anderson & McMillan, 2001; Sharp et al., 2010).

Similarly, EXT-induced aggression is an increase in aggressive behavior following the discontinuation of reinforcement (e.g., Azrin et al., 1966; Todd et al., 1989). For example, during baseline, an individual may be able to access escape by engaging in negative vocalizations. Following the implementation of escape EXT in which escape is no longer available for negative vocalizations, the participant may engage in higher levels of negative vocalizations (i.e., EXT burst). When negative vocalizations do not result in escape, the individual may engage in a behavior that is more likely to produce escape such as aggression (e.g., hitting, pinching, or kicking the therapist). Therefore, it is possible that within the context of treating food selectivity, there may be an increase in aggressive behavior following the implementation of escape EXT.

Extinction-induced emotional behavior is an increase in emotional responding such as crying and screaming following the discontinuation of reinforcement (Cowdery et al., 1990; Lerman & Iwata, 1996). For example, if an individual has learned to escape food presentation by refusing food, and escape EXT is implemented in which refusal is no longer reinforced, the individual may start to engage in emotional responding such as crying or screaming. Although researchers have not evaluated EXT-induced emotional behavior in the treatment of food selectivity, there are data to suggest that it may occur. Specifically, Allison et al. (2012) measured the negative vocalizations (i.e., crying or whining for at least 3 s) of a 3-year-old boy

diagnosed with ASD with food selectivity (i.e., he consumed different flavors of applesauce and Stage 3 baby food). During baseline, the participant escaped food presentation by engaging in disruptive mealtime behavior (i.e., turning his head away from food presentation or hitting the therapist's hand, arm, or spoon during presentation). Following the implementation of escape EXT (i.e., nonremoval of the spoon), disruptive mealtime behavior no longer resulted in escape from food presentation. Prior to the implementation of escape EXT, the participant engaged in zero levels of negative vocalizations; however, following the implementation of escape EXT, the participant engaged in moderate levels of negative vocalizations that decreased across sessions. These data suggest that the implementation of escape EXT (i.e., nonremoval of the spoon) may have been associated with an increase in negative vocalizations.

Although EXT bursts, EXT-induced aggression, and EXT-induced emotional behavior have not been directly or extensively studied in food selectivity research, other research has suggested their occurrence with the implementation of escape EXT. For example, Azrin et al. (1966) and Cowdery et al. (1990) evaluated the effects of EXT on the behavior of pigeons and a child with an intellectual and developmental disability (IDD), respectively. First, Azrin and colleagues evaluated the aversive properties of escape EXT through seven different experiments in which different aspects of EXT were manipulated (e.g., signaled vs. unsignaled EXT periods, extended EXT periods, food satiation) to determine the effects of escape EXT on the aggression of pigeons. Overall, Azrin and colleagues demonstrated that pigeons were more likely to engage in high rates of key pecks (i.e., EXT bursts) and EXT-induced aggression following the discontinuation of a reinforcer. Similarly, Cowdery and colleagues evaluated the effects of differential reinforcement of other behavior on the self-injurious behavior of a 9-year-old boy. Prior to the start of treatment, the experimenter identified the function of self-injury (i.e.,

scratching) through a functional analysis. Results of the functional analysis suggested that the participant's self-injury was maintained by automatic reinforcement (i.e., participant engaged in high levels of self-injury during the alone condition in the absence of social reinforcers). Following the implementation of escape EXT in which the participant was required to abstain from engaging in self-injury to earn the reinforcer (i.e., token), the participant engaged in a marked increase in the percentage of trials of crying, suggesting escape EXT was associated with an increase in emotional responding. Therefore, it is likely that the use of escape EXT to treat food selectivity may also result in EXT bursts, EXT-induced aggression, and EXT-induced emotional responding.

Finally, EXT-induced response variability is the emergence of different topographies of behavior following the discontinuation of reinforcement (e.g., Ahearn et al., 1996; Goh & Iwata, 1994; Sevin et al., 2002). Several researchers (Ahearn et al., 1996; Sevin et al., 2002; Sharp et al., 2010) have demonstrated EXT-induced response variability in their research on food selectivity. For example, Sevin et al. (2002) evaluated the effects of different escape EXT procedures on the acceptance, disruption, expulsion, and packing of a 34-month-old girl diagnosed with Pierre Robin sequence and various medical complications (e.g., gastroesophageal reflux disorder) who displayed food selectivity (i.e., accepted minimal amounts of solid foods). Following implementation of nonremoval of the spoon to reduce refusal, the participant engaged in high levels of acceptance accompanied by high levels of expulsion and moderate levels of packing (i.e., holding food in her mouth) emerged. Following the addition of re-presentation to reduce expulsion, the participant engaged in high levels of acceptance and low levels of expulsion; however, she displayed higher levels of packing. Following the addition of a redistribution procedure to reduce packing, the participant engaged in high levels of acceptance,

low levels of disruptive mealtime behavior, low levels of expulsion, and moderate to low levels of packing. These results suggest that restricting or reducing one response (e.g., expulsion) may result in strengthening an alternative response (e.g., packing).

In addition to the above-mentioned potential side effects, there are other risks that should be acknowledged with the implementation of escape EXT for treating food selectivity (Kodak & Piazza, 2008; Linscheid, 2006). For example, aspiration (i.e., food entering the airway) becomes more probable with the use of escape EXT due to increased emotional responding. If a novice therapist or caregiver is implementing escape EXT, it is possible that he or she will miss safety signs such as increased coughing or changes in facial color that would suggest aspiration (Piazza, Milnes, & Shalev, 2015). Therefore, it is important that novice therapists receive oversight such that aspiration risks are minimized.

Researchers have also warned about the incorrect implementation of escape EXT (Kodak & Piazza, 2008; Linscheid, 2006), which increases risk of injury (Luiselli, 2006). For example, with mandibular prompts, *gentle* pressure should be applied to the jaw; however, this procedure has the potential to be implemented incorrectly and potentially abused by therapists or caregivers. For example, Ives, Harris, and Wolchik (1978) conducted an evaluation to increase acceptance of non-preferred food in a 5-year-old boy diagnosed with various medical complications (e.g., rubella syndrome, respiratory difficulties) who consumed only high calorie liquids. During treatment, the experimenter presented food to the participant and if the participant refused the food, the experimenter placed the participant on his back and sat on top of the participant such that the participant could not escape. The experimenter placed the food in the participant's mouth. If the participant did not chew the food, the experimenter physically prompted chewing by scraping the food on the participant's teeth. Additionally, the

experimenter prevented spitting by placing a finger or two over the participant's mouth. Once the participant started to chew the food, the experimenter released the participant and praised the participant's eating. Although this procedure was effective for increasing acceptance, there are obvious issues with the way in which these procedures were implemented that would not be deemed ethical today. Although this is an extreme and somewhat dated example of misapplication, it suggests the importance of oversight for novice therapists and caregivers when implementing escape EXT.

Furthermore, inaccurate implementation of escape EXT or low treatment integrity could result in the worsening of feeding problems because intermittent reinforcement (i.e., escape from food presentation) is occasionally delivered to the participant for refusal or disruptive mealtime behavior. Intermittent reinforcement is often resistant to EXT and can result in an increase in the rate or intensity of behavior (Nevin & Wacker, 2013), which may produce further decrements in treatment integrity. Thus, it is important to implement escape EXT with high integrity. Although some food selectivity literature has suggested that caregivers can be trained to implement escape EXT with high integrity (e.g., Anderson & McMillan, 2001; Murphy & Zlomke, 2016; Najdowski et al., 2003), the challenges and risks associated with escape EXT may make it difficult for caregivers to maintain high treatment integrity.

For example, Anderson and McMillan (2001) evaluated the effects of parent training for a 5-year-old boy diagnosed with pervasive developmental disorder and a severe intellectual disability with food selectivity. During baseline, the experimenter instructed the parent to implement mealtimes as normal. Following baseline, the experimenter conducted behavioral skills training (i.e., verbal and written instruction, modeling, feedback, and role-play) with the parent to teach non-removal of the spoon and sequential presentation. Specifically, the

experimenter trained the parent to implement nonremoval of the spoon in which the parent presented the spoon at the participant's mouth and held it there until the participant accepted the bite, as well as sequential presentation in which the experimenter trained the parent to deliver praise and to provide the participant with a high-preferred drink following acceptance. Following initial training, the parent failed to implement nonremoval of the spoon on 60% of presentations of non-preferred food. However, following training on just preferred foods, the parent began to implement procedures more accurately. That is, the parent delivered reinforcers following 93% of accepted bites of non-preferred food and implemented nonremoval of the spoon following 97% of refused non-preferred foods, suggesting the parent was implementing procedures with high integrity when the experimenter delivered feedback. However, following a reversal to baseline, the parent rarely offered non-preferred foods and would often discontinue the presentation of non-preferred foods following participant protest, suggesting following the removal of experimenter feedback, high levels of treatment integrity may not maintain and caregivers may avoid presentation of non-preferred foods.

Similar to Anderson and McMillan (2001), McConnachie and Carr (1997) evaluated the effects of child behavior on the treatment integrity of three adults for teaching individuals with problem behavior. The experimenter trained the adults using behavioral skills training on the implementation of discrete trial training, escape EXT, and functional communication prior to the start of the evaluation. The experimenter instructed the adults to spend 50% of the session teaching non-tolerated tasks (i.e., tasks that evoked problem behavior from the child) and 50% of the session teaching tolerated tasks (i.e., tasks that evoked little to no problem behavior from the child). The experimenter conducted prompted and unprompted sessions. During prompted sessions, the experimenter coached the adults via bug-in-the-ear to ensure high treatment

integrity (i.e., procedures were being implemented correctly and non-tolerated tasks were being taught). During unprompted sessions, the experimenter provided the adult a one-page summary of the tasks and told the adult that they were qualified to carry out the teaching and behavior management protocols. Results demonstrated that during unprompted sessions, the percentage of correct applications of escape EXT and functional communication training remained high; however, there were significantly fewer opportunities to implement escape EXT as compared to prompted sessions because the adults avoided teaching non-tolerated tasks. In addition, adults reported high levels of stress during prompted sessions in which the experimenter prompted the adults to implement escape EXT. Overall, the results from Anderson and McMillan, as well as McConnachie and Carr, suggest that maintenance of treatment integrity may decrease over time and caregivers may avoid implementing procedures that are associated with problem behavior such as escape EXT.

In addition to the challenges and risks associated with escape EXT, coupled with the risks associated with decrements in treatment integrity, escape EXT may be difficult for caregivers to implement (Kodak & Piazza, 2008; Linscheid, 2006). If treatments are not implemented correctly (i.e., a caregiver does not follow through with escape EXT), then feeding problems can worsen or risks of aspiration and injury could increase (Piazza et al., 2015). Therefore, researchers have attempted to evaluate the efficacy of sequential presentation in the absence of escape EXT for treating food selectivity.

Sequential presentation without escape EXT. Numerous studies have evaluated the efficacy of sequential presentation in the absence of escape EXT for treating food selectivity (e.g., Penrod et al., 2010; Piazza et al., 2002; Riordan, Iwata, Wohl, & Finney, 1980; Riordan et al., 1984; VanDalen & Penrod, 2010). Riordan et al. (1980) evaluated the effects of sequential

presentation in the absence of escape EXT on increasing the number of bites of non-preferred food and number of grams consumed with a 9-year-old girl diagnosed with a moderate intellectual disability who displayed food selectivity (i.e., consumed limited amounts of food). During baseline, the experimenter placed a tray of food in front of the participant and delivered a prompt to eat. Sequential presentation was similar to baseline except the experimenter delivered a bite of preferred food and praise for acceptance. Once the participant was reliably accepting the food, the experimenter delivered the bite of preferred food and praise for swallows (i.e., clean mouth). Sequential presentation without escape EXT was effective for increasing the number of non-preferred food bites, as well as the number of grams consumed.

Similarly, Pizzo, Coyle, Seiverling, and Williams (2012) evaluated the effects of sequential presentation in the absence of escape EXT on the consumption and disruptive mealtime behavior of a 16-year-old diagnosed with ASD who displayed food selectivity. At the start of the study, the participant accepted grains, one meat, and one fruit. During sequential presentation, the experimenter delivered a high-preferred food and access to a beverage contingent on acceptance. Sequential presentation was effective for increasing consumption of non-preferred food and decreasing disruptive mealtime behavior.

Although several studies have demonstrated the efficacy of sequential presentation in the absence of escape EXT, there are several limitations that should be addressed in future research. First, the majority of studies that evaluated sequential presentation combined it with other procedures such as the high-*p* instructional sequence (e.g., Penrod et al., 2012), simultaneous presentation (e.g., Riordan et al., 1984), fading procedures (e.g., Barahona, DuBard, Luiselli, & Kesterson, 2013; Gentry & Luiselli, 2008; Valdimarsdóttir, Halldórsdóttir, & Sigurðardóttir, 2010), and response cost (i.e., access to the reinforcer was removed contingent upon refusal of

food; Buckley & Newchok, 2005; Murphy & Zlomke, 2016). Thus, it is unclear whether sequential presentation would have been effective in the absence of these additional procedures.

Second, it is possible the experimenters programmed procedural variations of escape EXT into several procedures for refusal of presented food. A few studies included three-step prompting in which the experimenter delivered verbal, model, and physical prompts contingent on refusal (e.g., Najdowski et al., 2003; Penrod et al., 2010; VanDalen & Penrod, 2010). For example, Penrod et al. (2010) presented foods using a three-step prompting procedure. If the participant did not accept the presented food within 5 s of the verbal prompt, the experimenter delivered a model prompt (i.e., the experimenter would model taking a bite). If the participant did not accept the food within 5 s of the model prompt, the experimenter delivered a physical prompt (i.e., the experimenter would place a bite at the participant's mouth or would physically guide the participant to place the bite at his mouth). During the prompting sequence, if the participant engaged in disruptive mealtime behavior or did not accept the bite within 5 s of the physical prompt, the experimenter delivered 30 s of escape. Although sequential presentation and three-step prompting were ineffective in the absence of escape EXT (i.e., nonremoval of the spoon) for two of the three participants, it is possible the three-step prompting procedure facilitated acceptance for the third participant. That is, the participant may have accepted bites to avoid the physical prompt. Likewise, several studies did not immediately remove the food contingent upon refusal (e.g., Brown, Spencer, & Swift, 2002; Gentry & Luiselli, 2008; McDowell et al., 2007; Penrod et al., 2012). For example, Penrod et al. (2012) presented a bite in front of the participant for 15 s. If the participant engaged in disruptive mealtime behavior, the experimenter immediately removed the bite; however, if the participant did not engage in disruptive mealtime behavior, the experimenter continued to present the bite for 15 s.

Third, most studies did not include systematic preference assessments to identify preferred stimuli to subsequently be used as reinforcers. In several studies, preferred foods were identified during baseline (Cooper et al., 1999; Riordan et al., 1984) or via caregiver and staff interviews (Buckley & Newchok, 2005; Gentry & Luiselli, 2008; Knox, Rue, Wildenger, Lamb, & Luiselli, 2012). In one study by Koegel et al. (2012), the experimenters identified preferred stimuli prior to each session by asking the participant to select a high-preferred food or tangible. However, in several studies (Barahona et al., 2013; Brown et al., 2002; McDowell et al., 2007; Piazza et al., 2002; Riordan et al., 1980), it is unclear how preferred stimuli were identified, which may account for the lack of effects for some participants. Thus, it is important to identify a high-preferred stimulus to be used as a reinforcer for acceptance of non-preferred food, particularly when escape EXT is not in place. Systematically determining reinforcers may increase the likelihood that those stimuli will compete with escape for refusal and disruptive behavior.

Manipulation of parameters of reinforcement. Several studies have suggested that sequential presentation is sometimes ineffective in the absence of escape EXT (e.g., Cooper et al., 1995; Najdowski et al., 2003; Piazza et al., 2002); however, it is possible that the ineffectiveness of the procedure was due to different magnitudes or qualities of reinforcement available for acceptance and refusal or disruptive mealtime behavior. The responding of the individual may depend on the rate of reinforcement available for each alternative (i.e., matching law; Baum, 1979; Hernstein, 1961). That is, when consequences for acceptance and refusal are equivalent, the individual may be more likely to engage in refusal and disruptive mealtime behavior than acceptance (e.g., Fisher et al., 1993). Therefore, it is possible to conceptualize mealtimes as a concurrent-operants arrangement in which two schedules of reinforcement are in

effect. One schedule is in effect for acceptance and the second for refusal and disruptive mealtime behavior. Therefore, to increase the efficacy of sequential presentation without escape EXT, it may be possible to manipulate different types (e.g., preferred food, preferred tangibles, preferred attention) or combinations of reinforcers to increase the overall quality and magnitude of reinforcement for acceptance as compared to reinforcement available for refusal and disruptive mealtime behavior.

For most participants in which sequential presentation without EXT has been evaluated, an experimenter delivered a single type of reinforcer contingent upon acceptance. Specifically, in most studies, the experimenter delivered a preferred food contingent upon acceptance (e.g., Cooper et al., 1999; Najdowski et al., 2003; Pizzo et al., 2012; Riordan et al., 1984; VanDalen & Penrod, 2010). However, in a few studies, the experimenter delivered a preferred tangible (e.g., Buckley & Newchok, 2005; Knox et al., 2012; McDowell et al., 2007; Riordan et al., 1984) or a preferred food or tangible (i.e., participant selected between food or tangible prior to session; e.g., Koegel et al. 2012). No studies have evaluated the delivery of high-preferred attention alone contingent upon acceptance. Furthermore, no studies have compared the effects of different types of reinforcers for increasing acceptance.

In addition to reinforcer type, it may be possible to increase acceptance of non-preferred foods in the absence of escape EXT through manipulations of the magnitude of reinforcement. In some evaluations of sequential presentation, the experimenter delivered either a combination of stimuli (e.g., Barahona et al., 2013; Cooper et al., 1999; Gentry & Luiselli, 2008) or a greater amount of preferred food contingent upon acceptance (e.g., Cooper et al., 1999; Najdowski et al., 2003; Penrod et al., 2010; Pizzo et al., 2010), which increases the magnitude of reinforcement available for acceptance as compared to the reinforcement available for refusal or disruptive

mealtime behavior (i.e., brief escape from food presentation). For example, Barahona et al. (2013) evaluated the effects of delivering a combination of stimuli on the acceptance of non-preferred foods of an 18-year-old woman diagnosed with ASD and a moderate intellectual disability with food selectivity. At the start of the study, the participant consumed macaroni and cheese, chicken nuggets, turkey sandwiches, cheese sticks, vegetable chips, and apple and mandarin orange fruit cups. During sequential presentation, the teacher delivered praise to the participant every 60 s if the participant was consuming the novel food or the home-packed food. Additionally, the teacher delivered a sticker to the participant each time she consumed all of the home-packed and novel foods. If the participant earned five stickers at the end of a week, the teacher allowed her to exchange the stickers for a small tangible item (e.g., jewelry) and gave her a special badge that allowed her to visit preferred staff in other locations. Although sequential presentation was combined with demand fading (i.e., portion of food increased at the start of each week), sequential presentation with the combination of stimuli was effective for increasing acceptance of non-preferred foods.

Penrod et al. (2010) evaluated the effects of the magnitude of reinforcement on parent implementation of sequential presentation in the absence of escape EXT with three children, ages 3 to 4, who were food selective (i.e., consistently ate at least three foods such as pancakes, chicken, and refried beans). Two participants were overly selective (i.e., accepted bites from one specific food group at a low, moderate, or high level) and one participant was moderately selective (i.e., accepted bites from one food group at moderate to high levels and bites from one or more food groups at low levels). Prior to the start of treatment, PSPAs were conducted to identify preferred and non-preferred foods. During sequential presentation, the parent presented non-preferred foods to the participant. If the participant accepted the food, the parent praised the

participant and delivered a high-preferred food. If the participant did not accept the food, the parent used a three-step prompting procedure (i.e., verbal, model, physical). If the participant did not accept the food 5 s following the physical prompt, the parent removed the food for 30 s. The parent immediately removed the food contingent on disruptive mealtime behavior. Next, the parent implemented demand fading (i.e., number of bites required prior to the delivery of the high-preferred food). Contingent upon acceptance of the bite requirement, the parent delivered praise, the high-preferred food, and terminated the meal. For all three participants, there were low levels of acceptance and swallows during both phases, suggesting sequential presentation and demand fading were ineffective. Next, the parent manipulated the magnitude of reinforcement in which the parent delivered a plate of high-preferred food contingent upon acceptance. The magnitude manipulation was effective for one participant. For the other two participants, the magnitude manipulation was not effective and escape EXT was necessary to increase acceptance. These data suggest that magnitude manipulations may be effective for increasing acceptance in the absence of escape EXT for some individuals. It is possible that the foods identified as high preferred (i.e., foods selected and consumed on 50% of the trials) were not actually high preferred and that they did not function as reinforcers, which may explain why the magnitude manipulation was not effective for increasing acceptance for two participants.

In another study, Cooper et al. (1999) evaluated the effects of different parameters of reinforcement in a concurrent-operants arrangement in the absence of EXT with two girls, ages 2 and 3, who both ate small portions of preferred foods (e.g., potato chips, fruit loops). Across all sessions, the experimenter presented two identical non-preferred foods on two separate plates and presented the plates to the participant. The plates were associated with different consequences for acceptance, depending on the manipulation. That is, the experimenter kept the

non-preferred foods on plates in front of the participant until the participant made a selection or time elapsed. Across all reinforcer manipulations, the experimenter delivered praise and social interaction contingent on selection of a non-preferred food. The experimenter ignored all tantrums and refusal.

For the first participant in Cooper et al. (1999), the experimenter manipulated reinforcer quantity (i.e., magnitude) and effort in the absence of escape EXT. During reinforcer quantity manipulations, the experimenter associated one plate with one preferred food and associated the other plate with two preferred foods. During this manipulation, the participant allocated responding toward the plate that resulted in a greater magnitude of reinforcement, suggesting reinforcer magnitude was effective for increasing acceptance of non-preferred food. Next, the experimenter manipulated effort in which the experimenter increased the number of bites of non-preferred food on the plate that resulted in access to two high-preferred bites. During this condition, the participant initially allocated responding toward the plate associated with a greater magnitude of reinforcement and effort; however, across sessions, the participant began responding similarly across both plates, suggesting effort affected responding towards both alternatives. Next, the experimenter again manipulated magnitude in which the experimenter increased the number of high-preferred bites to four on the plate associated with greater effort. During this condition, the participant allocated responding toward the plate with greater magnitude of reinforcement and response effort, suggesting reinforcer magnitude was effective for increasing acceptance of non-preferred food associated with a greater response effort. Overall, the first participant was more likely to select the option that resulted in a greater magnitude of reinforcement; however, effort (i.e., increased number of non-preferred bites) may have affected the participant's responding if the magnitude of reinforcement was not great

enough. For the second participant, results were similar in that the participant allocated responding towards the option associated with a higher quality and magnitude of reinforcement; however, escape EXT was necessary to increase acceptance of non-preferred food. The data from Cooper et al. suggested that reinforcer parameters may affect responding towards concurrently available schedules of reinforcement.

Although few studies in the food selectivity literature have involved evaluating the effects of different parameters of reinforcement for increasing acceptance in the absence of escape EXT, other areas of research (e.g., problem behavior) have suggested that it is possible to increase appropriate behavior and decrease problem behavior through manipulations of magnitude, quality, and rate of reinforcement (e.g., Athens & Vollmer, 2010; Carter, 2010; Hoch, McComas, Thompson, & Paone, 2002; Lalli & Casey, 1996; Lalli et al., 1999; Piazza et al., 1997). That is, when reinforcement favors appropriate behavior, the individual is likely to allocate responding toward appropriate behavior (e.g., compliance) rather than problem behavior. For example, researchers (e.g., Athens & Vollmer, 2010; Carter, 2010; Hoch et al., 2002; Lalli & Casey, 1996; Lalli et al., 1999; Piazza et al., 1997) have demonstrated that programming positive reinforcement for appropriate behavior (e.g., compliance) while continuing to provide escape for escape-maintained problem behavior is effective for increasing appropriate behavior, decreasing problem behavior, and decreasing the necessity of escape EXT as reinforcement favors appropriate behavior.

Carter (2010) compared different types of reinforcers (i.e., high-preferred edible, low-preferred edible, high-preferred leisure item, and escape) in the absence of escape EXT for increasing compliance and decreasing escape-maintained problem behavior for a 19-year-old man with a profound intellectual disability who engaged in aggression and property destruction.

Depending on the condition, if the participant engaged in compliance, then the experimenter delivered a reinforcer (i.e., high-preferred edible, low-preferred edible, high-preferred leisure item, or escape). If the participant engaged in problem behavior, then the experimenter delivered 30 s of escape. Results demonstrated that the delivery of a high-preferred edible or leisure item was effective for increasing compliance and decreasing problem behavior as compared to the delivery of a low-preferred edible or escape. These data suggest that different types of reinforcers, particularly the delivery of positive reinforcement, may be more or less effective for increasing appropriate behavior and decreasing problem behavior in the absence of escape EXT.

Athens and Vollmer (2010) evaluated the effects of reinforcer duration, quality, immediacy, and a combination of all three parameters for increasing compliance and decreasing escape-maintained problem behavior in the absence of escape EXT for seven individuals, ages 4 to 10, diagnosed with developmental disabilities. The participants allocated responding towards the schedule of reinforcement that was of greater reinforcer duration, quality, and immediacy across the majority of manipulations. Thus, increasing compliance and decreasing problem behavior. For example, during duration manipulations, the experimenter delivered 30- or 45-s access to the reinforcer for compliance and 5 or 10 s of escape for problem behavior. For both participants exposed to the duration manipulation, greater reinforcer duration for compliance resulted in high levels of compliance and low levels of problem behavior, suggesting longer durations of reinforcement for appropriate behavior were effective for shifting responding towards compliance in the absence of escape EXT. Overall, these data suggest that it is possible to manipulate different parameters of reinforcement to favor appropriate behavior in the absence of escape EXT. Thus, it is possible that manipulations of parameters of reinforcement could be

extended to the treatment of food selectivity to increase the efficacy of sequential presentation in the absence of escape EXT.

In summary, several studies have demonstrated that it is possible to increase acceptance of non-preferred foods with sequential presentation for individuals with food selectivity in the absence of escape EXT by delivering a combination of stimuli or a greater magnitude of reinforcement contingent upon acceptance (e.g., Barahona et al., 2013; Cooper et al., 1999; Gentry & Luiselli, 2008; Najdowski et al., 2003; Penrod et al., 2010; Pizzo et al., 2010). However, few studies have evaluated the effects of different parameters of reinforcement for increasing acceptance of non-preferred foods (e.g., Barahona et al., 2013; Cooper et al., 1999; Penrod et al., 2010), highlighting a need for researchers to determine whether manipulations to parameters of reinforcement would increase the efficacy of sequential presentation in the absence of escape EXT. The data from Penrod et al. (2010), Barahona et al. (2013), Cooper et al. (1999) and the problem behavior literature (e.g., Athens & Vollmer, 2010; Carter, 2010) suggest that it is possible to manipulate different parameters of reinforcement to favor appropriate behavior in the absence of escape EXT. By manipulating parameters of reinforcement, it may be possible to increase the efficacy of sequential presentation and reduce the need for escape EXT. Thereby, reducing the challenges and risks associated with escape EXT.

Purpose

The purpose of the current study was to evaluate the effects of sequential presentation without escape EXT while manipulating various reinforcer dimensions for acceptance of non-preferred food. First, we compared the effects of three sequential presentation procedures using various preferred stimuli (i.e., food, tangible, attention). If those sequential presentation procedures were ineffective, then we evaluated the effects of a sequential presentation procedure

in which we combined the three preferred stimuli. If the sequential presentation procedure with combined stimuli was ineffective, then we evaluated the effects of a sequential presentation procedure in which the duration of access to the combined stimuli was increased. Finally, if sequential presentation without escape EXT was ineffective with a longer duration of access, then we implemented escape EXT.

Method

Participants, Setting, and Materials

Eight children, ages 2 to 6, enrolled in either a university-based early intervention program or a university-based preschool program, participated in the current study. Children included both children with IDD (i.e., children diagnosed by a neurologist or psychologist) and typically developing children (i.e., children with no known diagnosis). We identified potential participants for the current study by one of two means. We identified some children by referral from teachers and interventionists who reported that the child was food selective based on observations of the child eating a limited variety of food during mealtimes. We identified other children by referral from caregivers. We distributed an informational letter (Appendix A) to the caregivers that reviewed the purpose of the study and provided contact information for the primary investigator. If caregivers were interested in their child participating in the study, they contacted the primary investigator.

After a child was referred, we conducted additional assessments to determine whether he or she met our criterion for being in the study and to determine preferred and non-preferred foods to use in various phases of the study. The criterion for being in the study was that the child was reported or observed to (a) accept some foods (e.g., fruits, grains) but not others (e.g., meats, vegetables) or (b) accept most food (e.g., bananas, strawberries) but refused some within a food

group (e.g., blueberries, grapes). We did not include a child in the study if he or she refused all foods or were selective by texture. For three children (Andre, Annie, and Anya), we conducted observations of mealtimes at school and caregiver discussions. During observations, we recorded the percentage of each food group (i.e., grain, vegetable, fruit, dairy, protein) consumed. For example, if the classroom teachers offered the child bread, peaches, peas, barbecue meatballs, and milk, and the child consumed the entirety of the peas, barbecue meatballs, and milk, then we would record 100% acceptance for vegetable, protein, and dairy and 0% acceptance for grain and fruit. In addition to the percentage consumed, we listed the specific foods that the child accepted and refused during observations. During caregiver discussions, we asked caregivers to identify preferred foods their child consistently accepted and rejected at home. In addition to foods the child regularly rejected, we asked caregivers to identify foods they regularly served at home that they would like their child to eat. Based on the information we obtained during observations and caregiver discussions, we could determine participant inclusion, as well as identify potential preferred and non-preferred foods.

For five children (Gaston, George, Harold, Margot, and Valerie), caregivers completed the Behavioral Feeding Assessment – Parent Interview (Appendix B; Budd, 1998) to determine participant inclusion. In completing the Behavioral Feeding Assessment – Parent Interview, caregivers listed information pertaining to (a) demographics (e.g., birthdate), (b) general developmental background (e.g., health conditions, overall development), (c) feeding history (e.g., medical restrictions on specific foods), (d) mealtime habits (e.g., preferred foods, types and textures the child accepts, foods that are rejected), and (e) current feeding problems (e.g., disruptive mealtime behavior). We adapted the Behavioral Feeding Assessment – Parent Interview to make the interview more efficient by removing some items that did not pertain to

the current study. We removed items related to (a) demographic information (e.g., household composition), (b) feeding history (e.g., feeding milestones achieved), (c) mealtime habits (e.g., meal schedule), (d) feeding techniques (e.g., sources of feeding information), and (e) treatment plans (e.g., caregivers' availability to participate in treatment). Additionally, we added an item that asked the caregivers to list foods regularly served at home that they would like their child to eat. We determined participant inclusion, as well as preferred and non-preferred foods through the information the caregiver provided in mealtime habits, which included items that assessed the favorite foods of the child, types of food that the child accepted, and types of food that the child refused. Additionally, we identified foods to target by the foods listed as items that the caregivers regularly prepared for meals that they would like for their child to consume. Finally, for all participants, we identified receptive language abilities (i.e., the number of instructions they could follow) by either the participant's most recent score on the listener milestone from the Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP; Sundberg, 2008) or teacher report.

Table 1 summarizes the age, diagnosis, and receptive language abilities of each participant as well as the foods accepted, foods refused, and problem behavior related to food selectivity as observed and reported by caregivers for each participant. Andre was a 4-year-old boy diagnosed with ASD. Based on his VB-MAPP scores, Andre was unable to follow one-step instructions and required model or physical prompts to complete instructions. Based on observations and discussions with his caregiver, Andre reliably accepted grains (e.g., rice, tater tots) but refused all vegetables and proteins, as well as some fruit (e.g., pineapple, pear). Additionally, Andre would eat too slowly, play with his food, spit out food, and refuse to open his mouth during mealtimes.

Annie was a 6-year-old girl diagnosed with ASD. Based on her VB-MAPP scores, Annie could follow two-step instructions (e.g., touch the desk then clap your hands). Based on observations and discussions with her caregiver, Annie reliably accepted grains (e.g., waffles, cornbread) and fruits (e.g., apple, blueberry) but refused all vegetables and most proteins (except for bacon and hotdogs). Additionally, Annie would gag when presented with meats, turn away from the food, and cry or tantrum during mealtimes.

Anya was a 5-year-old girl diagnosed with global developmental delays. Based on her VB-MAPP scores, Anya could follow two-step instructions (e.g., stand up and turn around). Based on observations and discussions with her caregiver, Anya reliably accepted most grains (e.g., rice, biscuits), dairy (e.g., queso, string cheese), and proteins (e.g., barbeque meatball, chicken nugget) but refused all vegetables (except for corn) and fruits. Additionally, Anya would turn away from food, throw or drop food, eat too little, push food way, and cry or tantrum during mealtimes.

Gaston was a 2-year-old boy with no known diagnosis. Based on teacher report, Gaston could follow three-step instructions (e.g., stand up, clap your hands, and hop on two feet). Based on caregiver interview, Gaston reliably accepted most grains (e.g., cereal, bread), fruits (e.g., cantaloupe, grapes), and dairy (e.g., yogurt, cheese) but refused all vegetables (except for vegetables in a chip form) and most proteins. Additionally, Gaston would spit food out, push food away, and refuse to open his mouth during mealtimes.

George was a 5-year-old boy with no known diagnosis. George could follow some two-step instructions (e.g., jump and then walk to me). Based on caregiver interview, George reliably accepted most grains (e.g., rice, Cheerios™), dairy (e.g., milkshake, cheese) and proteins (e.g.,

chicken, hot dogs) but refused all vegetables and fruits (except for banana). Additionally, George would leave the table and eat too little during mealtimes.

Harold was a 4-year-old boy diagnosed with ASD. Harold could follow instructions that included more than three steps (e.g., stand up, walk to your cubby, put your shoes on, and line up at the door). Based on caregiver interview, Harold reliably accepted limited grains (e.g., pancakes, Cheerios™), vegetables (e.g., carrots, bell peppers), fruits (e.g., green grapes, apples), and proteins (e.g., breakfast sausage, Starbucks™ breakfast sandwiches). That is, he refused most grains, vegetables, fruits, dairy, and proteins. Additionally, Harold would leave the table and push food away during mealtimes.

Margot was a 2-year-old girl diagnosed with ASD. Margot could follow some one-step instructions but required model or physical prompts to complete most instructions. Based on caregiver interview, Margot reliably accepted grains (e.g., waffles, stuffing) and proteins (e.g., steak, hamburger), as well as some dairy products (e.g., cheese) but refused all vegetables and fruits. Additionally, Margot would leave the table, push food away, refuse to open her mouth, and cry or tantrum during mealtimes.

Valerie was a 5-year-old girl diagnosed with Down syndrome and ASD. Valerie could follow some two-step instructions (e.g., clap and then spin). Based on caregiver interview, Valerie reliably accepted proteins (e.g., ground beef, meatballs) and some grains (e.g., orzo, pretzels) but refused all vegetables and fruits. Additionally, Valerie would eat too slow or too little, vomit or gag, spit food out, turn away from the food, leave the table, push food away, and cry or tantrum during mealtimes.

Graduate students served as therapists and conducted sessions two to four times per day, 4 to 5 days a week. Prior to the start of all sessions, the primary investigator trained all therapists

using instructions, modeling, rehearsal, and in-vivo feedback. In addition to training on procedures, all therapists were Heartsaver® Pediatric First Aid, CPR, and AED certified such that all therapists could detect and respond to signs of aspiration. The primary investigator periodically observed sessions following initial training to ensure that therapists were implementing procedures correctly and consistently, as well as following all trained safety precautions.

Therapists conducted sessions at least 30 min following meals. For each participant, we scheduled sessions such that we conducted sessions at the same time of day throughout the duration of the study. Although we attempted to control for time between meals, it is unclear whether participants had breakfast at home prior to arriving to the preschool. Therapists conducted all sessions at a table in the participant's classroom or a nearby session room (3 m by 3 m) equipped with a one-way mirror. During all sessions, a table, two chairs, and condition-specific stimuli were present. The therapist ensured a cup of water was available for the participant throughout the session. Additionally, the therapist wore gloves and had access to napkins or a towel to wipe the participant's face or clothing if needed. Following all sessions, the therapist cleaned the session area according to the center's licensing regulations. That is, the therapist sprayed the feeding surfaces (table, chairs) with soap water and wiped the surfaces with a single-use cloth (i.e., paper towel).

Response Measurement, Treatment Integrity, and Interobserver Agreement

Trained graduate and undergraduate research assistants collected data for participant and therapist behavior on a trial-by-trial basis using paper and pencil. Data collectors recorded acceptance, refusal, expulsion, and problem behavior on each trial. We defined *acceptance* as the participant opening his or her mouth and allowing placement of food in his or her mouth

within 5 s of presentation of the food. We defined *refusal* as failure to open the mouth or failure to accept food into the mouth within 5 s of presentation of the food. We defined *expulsion* as food larger than the size of a pea that was previously in the mouth exiting the mouth. For two participants (Anya and George), data collectors recorded clean mouth. We defined c*lean mouth* as no food larger than a pea remaining in the participant's mouth at a 30-s mouth check. Data collectors also scored the topography of problem behavior (i.e., escape behavior, negative vocalizations, gagging, and disruptive behavior). We defined *escape behavior* as engaging or attempting to engage in a behavior that places a greater distance between the participant and the presented food. This included pushing the food away, pushing the spoon away, covering the mouth, turning away from food presentation, and elopement (i.e., leaving or attempting to leave the table). We defined *negative vocalizations* as crying, screaming, whining, and protesting (e.g., "No!"). We defined *gagging* as coughing or heaving with movement of the chest and stomach or expelling air from the lungs with a sharp noise. We defined *disruptive behavior* as aggression (i.e., any behavior or attempted behavior directed toward the therapist that could result in harm), self-injurious behavior (i.e., any behavior or attempted behavior directed toward oneself that could result in harm), or property destruction (i.e., any behavior or attempted behavior that could result in damage to session materials).

Following each session, we converted the number of trials with acceptance, refusal, expulsion, and problem behavior to a percentage of trials by calculating the total number of trials with each behavior, dividing by the total number of trials, and multiplying by 100. We also calculated the percentage of trials with acceptance without expulsion by subtracting the number of trials with expulsion from the number of trials with acceptance, dividing by the total number

of trials, and multiplying by 100. We calculated the percentage of trials separately for both preferred and non-preferred trials when applicable (i.e., baseline).

Data collectors also collected data on therapist behavior on a trial-by-trial basis for at least 30% of sessions. Data collectors recorded the occurrence of reinforcer delivery, removal of spoon, and re-presentation. We defined *reinforcer delivery* as the delivery of the programmed stimulus (i.e., food, toy, attention, or combination of stimuli) to the participant. We defined *removal of spoon* as the removal of the non-preferred food more than 1 in. (2.54 cm) away from the participant. We defined *re-presentation* as the therapist presenting a bite of the previously expelled food at the participant's lips within 5 s of expulsion. Following sessions, we separately calculated the treatment integrity for percentage of correct reinforcer deliveries, removal of spoon, and re-presentations.

To calculate treatment integrity for each response, we divided the total number of correct implementations of the response (i.e., reinforcer delivery, removal of spoon, or re-presentation) by the total number of trials and multiplied by 100. During baseline, a reinforcer delivery should not occur; thus, we counted the omission of a reinforcer delivery as a correct implementation. Also during baseline, removal of the spoon should occur following refusal; thus, we counted the removal of the spoon following refusal as a correct implementation. Finally, re-presentation should not occur during baseline; thus, we counted the omission of re-presentation as a correct implementation. During treatment conditions in which escape EXT was not in place, a reinforcer delivery should occur following acceptance; thus, we counted reinforcer delivery following acceptance as a correct implementation. During these conditions, removal of spoon should occur following refusal; thus, we counted removal of the spoon following refusal as a correct implementation. Also during these conditions, re-presentation should not occur; thus, we

counted the omission of re-presentation as a correct implementation. During treatment conditions in which EXT was in place, reinforcer delivery should occur following acceptance; thus, we counted reinforcer delivery following acceptance as a correct implementation. During these conditions, removal of spoon should not occur; thus, we counted the omission of removal of the spoon as a correct implementation. Also, during these conditions, re-presentation should occur following expulsion, thus, we counted re-presentation following expulsion as a correct implementation.

We calculated treatment integrity for an average of 49.7% of sessions across participants. We calculated treatment integrity for 41.1% of sessions for Andre. Mean treatment integrity was 99.2% (range, 70%-100%) for reinforcer delivery, 99.7% (range, 70%-100%) for removal of spoon, and 100% for re-presentation. We calculated treatment integrity for 53.6% of sessions for Annie. Mean treatment integrity was 99.9% (range, 95%-100%) for reinforcer delivery, 99.9% (range, 95%-100%) for removal of spoon, and 100% for re-presentation. We calculated treatment integrity for 38.8% of sessions for Anya. Mean treatment integrity was 100% for reinforcer delivery, 99% (range, 90%-100%) for removal of spoon, and 100% for re-presentation. We calculated treatment integrity for 51.1% of sessions for Gaston. Mean treatment integrity was 99.7% (range, 90%-100%) for reinforcer delivery, 99.7% (range, 90%-100%) for removal of spoon, and 100% for re-presentation. We calculated treatment integrity for 59.5% of sessions for George. Mean treatment integrity was 99% (range, 70%-100%) for reinforcer delivery, 99.3% (range, 70%-100%) for removal of spoon, and 99.9% (range, 95%-100%) for re-presentation. We calculated treatment integrity for 70.9% of sessions for Harold. Mean treatment integrity was 99.9% (range, 90%-100%) for reinforcer delivery, 99.7% (range, 87.5%-100%) for removal of spoon, and 100% for re-presentation. We calculated treatment

integrity for 58.1% of sessions for Margot. Mean treatment integrity was 99.8% (range, 85%-100%) for reinforcer delivery, 99.8% (range, 90%-100%) for removal of spoon, and 99.9% (range, 95%-100%) for re-presentation. We calculated treatment integrity for 62.7% of sessions for Valerie. Mean treatment integrity was 100% for reinforcer delivery, 99.5% (range, 85%-100%) for removal of spoon, and 100% for re-presentation.

A second independent observer collected data on child and therapist behavior for an average of 63.9% of sessions across participants. We calculated interobserver agreement (IOA) for acceptance, refusal, expulsion, clean mouth (Anya and George), problem behavior, reinforcer delivery, removal of spoon, and re-presentation using exact agreement. We defined agreements for each response as each observer scoring (occurrence) or not scoring (nonoccurrence) a response on a trial. To calculate IOA for each response, we summed the number of trials with agreement, divided by the total number of trials, and multiplied by 100.

We calculated IOA for 50% of sessions for Andre. Mean agreement was 99.8% (range, 90%-100%) for acceptance, 99.8% (range, 90%-100%) for refusal, 99.2% (range, 90%-100%) for expulsion, 98.5% (range, 90%-100%) for problem behavior, 99.4% (range, 80%-100%) for reinforcer delivery, 97.1% (range, 0%-100%) for removal of spoon, and 100% for re-presentation. We calculated IOA for 72.3% of sessions for Annie. Mean agreement was 99.9% (range, 95%-100%) for acceptance, 99.9% (range, 95%-100%) for refusal, 99.8% (range, 95%-100%) for expulsion, 99.1% (range, 85%-100%) for problem behavior, 99.8% (range, 95%-100%) for reinforcer delivery, 99.8% (range, 95%-100%) for removal of spoon, and 100% for re-presentation. We calculated IOA for 68.7% of sessions for Anya. Mean agreement was 99.8% (range, 90%-100%) for acceptance, 99.8% (range, 90%-100%) for refusal, 99.5% (range, 85.7%-100%) for expulsion, 96.6% (range, 75%-100%) for clean mouth, 99.1% (range, 90%-100%) for

problem behavior, 99.8% (range, 95%-100%) for reinforcer delivery, 99% (range, 95%-100%) for removal of spoon, and 100% for re-presentation. We calculated IOA for 58% of sessions for Gaston. Mean agreement was 99.5% (range, 90%-100%) for acceptance, 99.5% (range, 90%-100%) for refusal, 99.8% (range, 90%-100%) for expulsion, 99.1% (range, 92.5%-100%) for problem behavior, 100% for reinforcer delivery, 99.6% (range, 90%-100%) for removal of spoon, and 99.7% (range, 75%-100%) for re-presentation. We calculated IOA for 60.7% of sessions for George. Mean agreement was 99.9% (range, 95%-100%) for acceptance, 99.9% (range, 95%-100%) for refusal, 99.7% (range, 90%-100%) for expulsion, 92.6% (range, 0%-100%) for clean mouth, 99.5% (range, 77.5%-100%) for problem behavior, 99.6% (range, 90%-100%) for reinforcer delivery, 98.9% (range, 0%-100%) for removal of spoon, and 100% for re-presentation. We calculated IOA for 71.6% of sessions for Harold. Mean agreement was 100% for acceptance, 100% for refusal, 100% for expulsion, 98.6% (range, 90%-100%) for problem behavior, 100% for reinforcer delivery, 99.6% (range, 90%-100%) for removal of spoon, and 100% for re-presentation. We calculated IOA for 63.8% of sessions for Margot. Mean agreement was 100% for acceptance, 100% for refusal, 99.9% (range, 95%-100%) for expulsion, 98.4% (range, 75%-100%) for problem behavior, 99.9% (range, 90%-100%) for reinforcer delivery, 99.6% (range, 85%-100%) for removal of spoon, and 100% for re-presentation. We calculated IOA for 65.9% of sessions for Valerie. Mean agreement was 99.9% (range, 95%-100%) for acceptance, 99.9% (range, 95%-100%) for refusal, 98.4% (range, 0%-100%) for expulsion, 99.7% (range, 95%-100%) for problem behavior, 100% for reinforcer delivery, 99.4% (range, 90%-100%) for removal of spoon, and 100% for re-presentation.

Although the mean percentages of IOA were high across participants and behaviors, the ranges depict that some IOA percentages were low for some sessions. For sessions in which

IOA percentages were below 80%, therapists retrained observers on the definitions of each behavior and data collection procedures.

Preference Stimuli Preference Assessments

Prior to the start of the study, we conducted three PSPAs (Fisher et al., 1992) with each participant to determine the high-preferred stimuli (i.e., food, toys, attention) that we included in the treatment evaluation. During all PSPAs, the therapist presented two stimuli during each trial and asked the participant to choose his or her favorite. Upon selection of a stimulus, the therapist provided the participant access to the stimulus for 30 s (or until consumed). The therapist continued to present trials until she presented all stimuli with each other once. We determined the relative preference of each stimulus by summing the number of trials that the participant selected the item, dividing by the total number of times that the therapist presented the item, and multiplying by 100. We created a preference hierarchy based on the percentage of trials each stimulus was selected.

Food PSPA. Therapists conducted a food PSPA with at least seven foods identified during the caregiver discussion or interview as being high preferred. Therapists used the top three ranked foods in the pre-treatment PSPA (see below). For two of the eight participants (Annie and Gaston), the caregivers indicated that fruit was highly preferred. Therefore, we conducted two separate food PSPAs. One with seven snack items and the other with seven fruits. We used the top three ranked foods from the snacks and fruits PSPAs in the pre-treatment PSPA. For all participants, we selected a moderately preferred food (i.e., a food selected approximately 50% of times it was presented) for use during exposure trials prior to the start of all sessions.

Toy PSPA. Therapists conducted a toy PSPA with at least 12 high-preferred items (e.g., iPad, music, videos) that we identified through caregiver report, participant observation (i.e., the therapist observed and recorded the types of toys the participant interacted with throughout the day), and our knowledge of toys that are often preferred by preschool-age children but were not commonly available in the classroom. During this assessment, the therapist delivered the selected item and naturalistic interaction for approximately 30 s (e.g., "Look at you stack the blocks!"). The therapist provided naturalistic interactions during this preference assessment, as the therapist would deliver this type of interaction during treatment sessions in which the therapist provided the participant access to a toy. We used the top two toys, selected on at least 80% of trials, as the high-preferred toys during conditions in which we programmed a toy as the high-preferred stimulus following acceptance.

Attention PSPA. Therapists conducted an attention PSPA (Kelly, Roscoe, Hanley, & Schlichenmeyer, 2014) with seven different topographies of attention (e.g., tickles, conversation, funny faces) and a control stimulus (i.e., blank card associated with the delivery of no attention). We included a control stimulus to ensure that the participant discriminated between the control stimulus in which the therapist provided no interaction and the attention cards. We identified the attention topographies through caregiver report and participant observation (i.e., therapist observed and recorded the types of attention delivered throughout the day to the participant). Prior to the attention PSPA, the therapist took pictures with the participant that depicted each topography of attention (see Appendix C) and placed the picture on a colored card such that the therapist paired each topography of attention with a different color to enhance discrimination. During the PSPA, the therapist presented pictures of attention and the control stimulus to the participant. Following selection of an attention topography, the therapist delivered the selected

topography of attention for approximately 30 s. Following selection of the control stimulus, the therapist looked down and did not interact with the participant for approximately 30 s. We used the top two topographies of attention, selected on at least 80% of trials, as the high-preferred attention during conditions in which we programmed attention as the high-preferred stimulus following acceptance.

Six of eight participants did not select a topography of attention for at least 80% of trials. Because of this, we made modifications to the assessment by reducing the number of stimuli in the assessment. For four of the six participants (Anya, Gaston, George, and Valerie), reducing the number of stimuli in the PSPA was effective for identifying a high-preferred topography of attention. For two participants (Andre and Margot), the reduction in stimuli was ineffective for identifying a high-preferred attention, thus we changed the type of assessment to identify a preferred topography of attention. For Andre, we attempted to conduct a single stimulus preference assessment (SSPA; Pace, Ivancic, Edwards, Iwata, & Page, 1985) in which a single topography of attention was available. During this assessment, we evaluated three topographies of attention (hugs, tickles, pick up) and the control stimulus. During the SSPA, the therapist placed a picture depicting the topography of attention or the control stimulus in front of the participant. Contingent on a picture touch, the therapist delivered the topography of attention for approximately 30 s. Sessions were 5 min, and we measured the frequency of picture touches. During this assessment, Andre engaged in more picture touches towards the control card compared to the attention topographies. Because Andre often signs “more” for food and toys, we attempted to measure “more” during the single stimulus preference assessment instead of a picture touch. During this assessment, he did not sign “more” for any topographies of attention

or the control stimulus. Therefore, we did not evaluate the effects of attention in the treatment evaluation with Andre.

For Margot, we evaluated in-zone behavior (Cote, Thompson, Hanley & McKerchar, 2007) to determine preference. During this assessment, we evaluated three different topographies of attention (i.e., foot rubs, bounce on ball, pick up and spin) that were associated with the greatest percent selection during the initial PSPA and a control stimulus. We conducted sessions in a small session room divided into two zones that each contained a therapist associated with a specific topography of attention or control. Sessions were 5 min (i.e., 300 s) in length, and we collected data on in-zone behavior using a duration measure. We defined in-zone behavior as the child's full body being in the zone (as determined by tape in the middle of the room).

Results of the food, toy, and attention preference assessments are depicted in Table 2. Andre's top preferred foods were Starbursts®, cheddar rice cakes, and Doritos® Nacho Cheese, which he selected on 80%, 80%, and 60% of trials, respectively. Andre's moderately preferred food was Welch's® Fruit Snacks, which he selected on 40% of trials. Andre's high-preferred toys were pins and needles and light up fan, which he selected on 100% and 83% of trials, respectively. We were unable to identify a high-preferred attention for Andre. Annie's top preferred snack foods were cheddar popcorn, cheddar rice cakes, and Goldfish® Pretzel, which she selected on 100%, 83.3%, and 66.7% of trials, respectively. Annie's top preferred fruits were blueberry, apple, and pineapple, which she selected on 100%, 83.3%, and 66.7% of trials, respectively. Annie's moderately preferred food was tortilla chip, which she selected on 50% of trials. Annie's high-preferred toys were sensory bottles and light up wand; she selected both on

83.3% of trials. Annie's high-preferred attention topographies were cuddles and funny faces, which she selected on 100% and 85.7% of trials, respectively.

Anya's top preferred foods were Ritz Crackers, Cheetos®, and animal crackers, which she selected on 100%, 80%, and 60% of trials, respectively. Anya's moderately preferred food was tortilla chip, which she selected on 40% of trials. Anya's high-preferred toys were piano and music box, which she selected on 91% and 82% of trials, respectively. Anya's high-preferred attention topographies were singing and jumping, which she selected on 100% and 67.7% of trials. Although Anya selected jumping at 67.7%, this was during a PSPA in which there were only four stimuli, thus, she selected jumping on every trial except when it was pitted against singing.

Gaston's top preferred snack foods were Welch's® Fruit Snacks, vanilla bunny grahams, and Veggie Straws®, which he selected on 100%, 83.3%, and 50% of trials, respectively. Gaston's top preferred fruits were apple, grape, and cantaloupe, which he selected on 100%, 83.3%, and 66.7% of trials, respectively. Gaston's moderately preferred food was chocolate bunny grahams; he selected both on 50% of trials. Gaston's high-preferred toys were bubble gun and furry ball both which he selected on 83.3% of trials. Gaston's high-preferred attention topographies were conversation and praise, which he selected on 100% and 75% of trials, respectively. Although praise was selected at 75%, this was during a PSPA in which there were only five stimuli, thus, he selected praise on every trial except when it was pitted against conversation.

George's top preferred foods were chocolate bunny grahams, chips, and Honey Bunches of Oats®, which he selected on 100%, 83%, and 50% of trials, respectively. George's moderately preferred food was rice cake, which he selected this on 50% of trials. George's high-

preferred toys were pins and needles and bubble gun, which he selected on 100% and 87.5% of trials, respectively. George's high-preferred attention topography was chase, which he selected on 100% of trials.

Harold's top preferred foods were deli turkey, rice cakes, and breaded chicken, which he selected on 100%, 80%, and 60% of trials, respectively. Harold's moderately preferred food was Goldfish® Pretzel, which he selected on 66.6% of trials. Harold's high-preferred toys were music box and bubble gun, which he selected on 91% and 82% of trials, respectively. Harold's high-preferred attention topographies were silly conversations and tickles, which he selected on 86% and 79.5% of trials, respectively.

Margot's top preferred foods were Ritz Cheese Crackers, Oreos®, and Little Debbie™ Honey Buns, which she selected on 83%, 83%, and 66% of trials, respectively. Margot's moderately preferred food was pita pockets, which she selected on 33% of trials. During the treatment evaluation, we switched Margot's moderately preferred food to Ritz Cheese Crackers, as she did not reliably accept the pita pockets. Margot selected Ritz Cheese Crackers on 60% of the trials during the pre-treatment PSPA. Margot's high-preferred toy was the iPod in which the song "Let It Go" (Anderson-Lopez, K., & Lopez, R., 2013, track 5) played, which she selected on 100% of trials. Margot's high-preferred attention topography was foot rubs. During the in-zone assessment, she spent an average of 279 s (i.e., average of 93% of the session) in the zone associated with foot rubs. All other topographies of attention and the control stimulus were associated with lower and undifferentiated levels of in-zone behavior.

Valerie's top preferred foods were potato chip, Cheerios™, and popcorn, which she selected on 100%, 75%, and 63% of trials, respectively. Valerie's moderately preferred food was Ritz Crackers, which she selected on 63% of trials. During the treatment evaluation, we

switched Valerie's moderately preferred food to Goldfish® Pretzel, as she did not reliably accept the Ritz Crackers. Valerie's high-preferred toys were light up wand and maracas; she selected both on 81.8% of trials. Valerie's high-preferred attention topographies were cheers and tickles, which she selected on 100% and 75% of trials, respectively. Although tickles were selected on 75% trials, this was during a PSPA in which there were only five stimuli, thus, she selected tickles on every trial except when it was pitted against cheers.

A second independent observer collected data on participant selection during the food, toy, and attention preference assessments for an average of 96.3% of trials across participants. For PSPAs, we used the trial-by-trial agreement method in which we divided the number of trials with agreement (i.e., both observers scored the selection of the same item) by the total number of trials and multiplied by 100%. For the SSPA (Andre) and in-zone assessment (Margot), we used total agreement method in which we divided the smaller number of responses or duration scored by the larger number of responses or duration scored and multiplied by 100%. We calculated IOA for 91.2% of PSPA trials and 100% of SSPA sessions for Andre. Mean IOA for Andre was 100% for both assessment formats. We calculated IOA for 91.8% of trials for Annie. Mean IOA for Annie was 99.4% (range, 96.4%-100%). We calculated IOA for 99.4% of trials for Anya. Mean IOA for Anya was 98.2% (range, 95.5%-100%). We calculated IOA for 92.7% of trials for Gaston. Mean IOA for Gaston was 99.6% (range, 98.7%-100%). We calculated IOA for 100% of trials for George. Mean IOA for George was 99.5% (range, 97.2%-100%). We calculated IOA for 100% of trials for Harold. Mean IOA for Harold was 99.4% (range, 96.4%-100%). We calculated IOA for 100% of PSPA trials and 33.3% of in-zone assessment sessions for Margot. Mean IOA for Margot was 100% for both assessment formats. We calculated IOA for 95.2% of trials for Valerie. Mean IOA for Valerie was 98.8% (range, 97%-100%).

Pre-Treatment PSPA

We conducted a pre-treatment PSPA prior to the start of each treatment evaluation for each participant. The pre-treatment PSPA served two purposes. First, we used the pre-treatment PSPA to validate caregiver report of non-preferred food. That is, we conducted this assessment to ensure the participant rarely accepted the three non-preferred foods targeted for treatment. If they accepted these foods during the pre-treatment PSPA, we identified different foods to include. Second, we used the pre-treatment PSPA to identify two high-preferred foods to be used during conditions in which we programmed food as the high-preferred stimulus following acceptance. We included three high-preferred foods (identified via the food PSPA) and three non-preferred foods targeted for intervention (identified via caregiver interview) in the pre-treatment PSPA. For Annie and Gaston, we included three high-preferred snacks and three high-preferred fruits (identified via their food PSPAs). Procedures were identical to the previous PSPAs in which the therapist paired each food with all other foods once. Following this assessment, we created a preference hierarchy based on the percentage of trials the participant selected each food. We used the foods ranked one and two as the high-preferred foods during baseline and during conditions in which we programmed food as the high-preferred stimulus following acceptance.

Post-Treatment PSPA

We conducted post-treatment PSPAs following each effective treatment in which the participant was reliably accepting non-preferred food without expulsion (i.e., greater than 90% of trials). Specifically, we conducted post-treatment PSPAs either following reversal to baseline phases in which we observed maintenance of behavior change or once we had faded the schedule of reinforcement for the effective treatment. Post-treatment PSPA procedures were identical to

pre-treatment PSPAs and contained the same foods (i.e., the three high-preferred foods and three non-preferred foods). If we conducted subsequent treatment evaluations with new non-preferred foods for a participant, we used the top three ranked foods from the post-treatment PSPA in the subsequent pre-treatment and post-treatment PSPA for that participant. We conducted post-treatment PSPAs to determine if there were any shifts in preference of non-preferred foods following exposure to an effective treatment or if participants at least began selecting non-preferred foods more than 0% of trials, which was often observed in pre-treatment PSPAs.

A second independent observer collected data on participant selection during the pre- and post-treatment PSPAs for an average of 93.5% of trials across participants. We used the trial-by-trial agreement method in which we divided the number of trials with agreement (i.e., both observers scored the selection of the same item) by the total number of trials and multiplied by 100%. We calculated IOA for 85% of trials for Andre, and mean IOA was 100%. We calculated IOA for 100% of trials for Annie, and mean IOA was 100%. We calculated IOA for 100% of trials for Anya, and mean IOA was 100%. We calculated IOA for 93.1% of trials for Gaston, and mean IOA was 100%. We calculated IOA for 91.1% of trials for George, and mean IOA was 100%. We calculated IOA for 100% of trials for Harold, and mean IOA was 100%. We calculated IOA for 90.5% of trials for Margot, and mean IOA was 100%. We calculated IOA for 88% of trials for Valerie, and mean IOA was 100%.

General Procedure

We conducted an initial baseline for all participants to determine the degree to which they accepted non-preferred and preferred foods that were interspersed across trials. Next, we evaluated the effects of different conditions of sequential presentation (SEQ) without EXT. For all participants, we compared the effects of SEQ without EXT using different high-preferred

stimuli (i.e., food, toy, and attention) as reinforcers for acceptance of non-preferred foods. If SEQ without EXT was ineffective with each of these different types of high-preferred stimuli for a participant, then we evaluated the effects of SEQ without EXT with a combination of those high-preferred stimuli as reinforcers for acceptance of non-preferred foods. If this was ineffective for a participant, then we evaluated the effects of SEQ without EXT with the combination of high-preferred stimuli and an increased duration of reinforcer access for acceptance of non-preferred foods. If this was ineffective for a participant, then we evaluated the effects of SEQ *with* EXT (i.e., nonremoval of the spoon and re-presentation) with a combination of high-preferred stimuli as reinforcers for acceptance of non-preferred foods.

Prior to the start of all sessions, the therapist conducted a brief preference assessment (DeLeon, Fisher, et al., 2001) with the participant to determine the high-preferred food (baseline and treatment evaluation), high-preferred toy (treatment evaluation), high-preferred attention (treatment evaluation), or combination of high-preferred stimuli (treatment evaluation) to use during the session (depending on the type of session). For sessions in which the therapist presented a single high-preferred food as a trial (baseline), the therapist presented the two high-preferred foods as determined by the pre-treatment PSPA and said, "Pick one." Immediately following participant selection, the therapist provided the participant access to the food until the participant consumed the food. For sessions in which the therapist used a single high-preferred stimulus as a reinforcer (treatment evaluation), the therapist presented the two high-preferred items (or pictures of stimuli for sessions in which attention was used as a reinforcer) as determined by the pre-treatment PSPA (food) or initial PSPA (toy and attention) and said, "Pick one." Immediately following participant selection for one of the items or pictures, the therapist provided the participant access to the item for either 30 s (attention and toy) or until the

participant consumed the item (food). For sessions in which the therapist used a combination of high-preferred stimuli as reinforcers, the therapist conducted separate brief preference assessments for each stimulus.

Immediately prior to all sessions, the therapist provided pre-session exposure to the programmed contingencies for a session by placing a small piece of a moderately preferred food (identified in the food PSPA) on the spoon or plate (Anya only), stating the session contingencies (e.g., "When you take a bite of your vegetables, you get tickles"), presenting the spoon or plate to the participant, and saying, "Take a bite." If the participant accepted the bite of moderately preferred food within 5 s (all participants) and had a clean mouth (Anya and George), the therapist delivered the condition-specific consequence (e.g., 30-s access to tickles). If the participant did not accept the moderately preferred food within 5 s, the therapist removed the moderately preferred food, waited approximately 30 s, restated the session contingencies, and re-presented the moderately preferred food to the participant. If the participant did not accept the moderately preferred food within 5 s of the second presentation, the therapist removed the moderately preferred food and subsequently started the session. Although this occurred infrequently, we changed the moderately preferred food for two participants (Margot and Valerie) to increase the likelihood that they would accept the moderately preferred food and contact the session contingencies.

During baseline, the therapist presented 10 trials of three different non-preferred foods and 10 trials of one high-preferred food (determined via their pre-session PSPA) except for Annie and Anya (initial participants) for whom the therapist presented 15 trials of three different non-preferred foods and five trials of one high-preferred food (determined via their pre-session PSPA). Regardless, during baseline 20 trials were presented. During treatment sessions, the

therapist presented 10 trials of three different non-preferred foods except for Annie and Anya for whom the therapist presented 20 trials of three different non-preferred foods. Prior to each session, the therapist selected a number from a hat that corresponded to 10 pre-made data sheets to determine the order in which the therapist presented foods during sessions. The therapist created the data sheets using a random list generator prior to the start of the study such that the order of food presentation was quasi random in which the therapist presented no more than two of the same foods in a row.

At the start of each trial, the therapist placed a small portion of the preferred food (i.e., quarter of the spoon; baseline only) or non-preferred food (i.e., quarter of the spoon; all sessions) on the spoon. For Anya, the therapist placed a small portion of the preferred food (i.e., quarter of a spoon; baseline only) or non-preferred food (i.e., quarter of a spoon; all sessions) on a plate. We presented food to Anya on a plate because she would accept food the therapist presented on a spoon; however, she would not accept food the therapist presented on a plate. Next, the therapist prompted the participant to take a bite and placed the spoon at the participant's mouth or placed the plate in front of the participant (Anya). Once the approximately 30-s trial elapsed, the therapist presented the next trial. For Anya and George, the therapist conducted a mouth check 30 s following acceptance to ensure that food larger than a pea was no longer present in the participant's mouth prior to moving to the next trial. That is, the therapist waited 30 s to verbally prompt the participant to open his or her mouth (i.e., "Open."). If the participant did not open his or her mouth following the verbal prompt, then the therapist delivered the verbal prompt with a model prompt (i.e., the therapist modeled an open mouth); however, this was infrequently necessary. We implemented a clean mouth procedure for Anya because she packed non-preferred foods. We implemented a clean mouth procedure for George because during initial

treatment sessions, he would accept the non-preferred food, gain access to the high-preferred stimulus or stimuli, and expel the non-preferred food.

If the participant engaged in problem behavior during session, the therapist implemented procedural safeguards such as conducting sessions in a padded room and support from an additional therapist. Procedural safeguards for participants are depicted in Table 3. For Andre and Annie, we conducted sessions in a padded room to reduce the likelihood of injury due flopping and flailing during sessions. Additionally, for participants in which we evaluated EXT (Gaston, Margot, and Valerie), a second therapist was present to help block disruptive behavior towards the primary therapist if needed. If the participant engaged in problem behavior during food presentation, then the therapist ignored the problem behavior and implemented procedural safeguards (e.g., response blocking) if necessary. If the participant engaged in problem behavior following acceptance or removal of the spoon, then the therapist did not deliver any programmed consequences and implemented procedural safeguards (e.g., response blocking) if necessary. If the participant gagged or vomited during session, then the therapist implemented necessary safety procedures and terminated the session. Gagging and vomiting were infrequent. Anya engaged in two separate instances of gagging and the therapist terminated both sessions.

Conditions

Baseline. During baseline sessions, if the participant accepted the preferred or non-preferred foods within 5 s of food presentation, then the therapist delivered praise (e.g., "Nice job eating the cucumber!) and waited 30 s to start the next trial. If the participant refused the preferred or non-preferred foods or engaged in problem behavior within 5 s of food presentation, then the therapist removed the spoon or plate (Anya) for 30 s and did not provide any other programmed consequences. Following this 30 s, the therapist presented the next trial. If the

participant expelled the food after acceptance, then the therapist did not deliver any programmed consequences. For Anya and George, following acceptance, the therapist conducted a clean mouth check. If the participant had a clean mouth, then the therapist delivered praise (e.g., "Nice job eating the cucumber!") and waited 30 s to start the next trial.

SEQ. Sequential presentation sessions were similar to baseline; however, if the participant accepted the non-preferred food within 5 s of presentation, then the therapist delivered a high-preferred item (i.e., high-preferred food, toy, or attention) or items (i.e., combination of high-preferred stimuli) and praise (e.g., "Nice job eating the cucumber!") to the participant. For Anya and George, if they accepted the non-preferred food within 5 s of presentation and had a clean mouth at the 30-s mouth check, then the therapist delivered a high-preferred item (i.e., high-preferred food, toy, or attention) or items (i.e., combination of high-preferred stimuli) and praise (e.g., "Nice job eating the cucumber!"), thus the delivery of the high-preferred item or items was delayed and contingent on a clean mouth.

SEQ (Food [F]). During SEQ (F) sessions, the therapist held a piece of high-preferred food behind the spoon within the participant's view (see Appendix D for a visual representation). If the participant accepted the non-preferred food within 5 s of food presentation, then the therapist immediately delivered one piece of the high-preferred food to the participant by placing the high-preferred food in the participant's hand or mouth. For Anya and George, if they accepted the non-preferred food within 5 s of food presentation and had a clean mouth at the 30-s mouth check, then the therapist immediately delivered one piece of the high-preferred food to the participant by placing the high-preferred food in the participant's hand or mouth.

SEQ (Toy [T]). During SEQ (T) sessions, the therapist held a high-preferred toy behind the spoon within the participant's view (see Appendix E for a visual representation). If the

participant accepted the non-preferred food within 5 s of food presentation, then the therapist immediately delivered the high-preferred toy and naturalistic interaction (e.g., “I love the way you are playing with that toy.” and “Wow! That’s so cool.”) to the participant for 30 s. For Anya and George, if they accepted the non-preferred food within 5 s of food presentation and had a clean mouth at the 30-s mouth check, then the therapist immediately delivered the high-preferred toy to the participant for 30 s.

SEQ (Attention [A]). During SEQ (A) sessions, the therapist held a picture of the high-preferred attention behind the spoon within the participant’s view (see Appendix F for a visual representation). If the participant accepted the non-preferred food within 5 s of food presentation, then the therapist immediately delivered the high-preferred attention to the participant for 30 s. For Anya and George, if they accepted the non-preferred food within 5 s of food presentation and had a clean mouth at the 30-s mouth check, then the therapist immediately delivered the high-preferred attention to the participant for 30 s.

SEQ (combo). During SEQ (combo) sessions, the therapist placed the high-preferred food, toy, and picture of attention within the participant’s view (see Appendix G for a visual representation). For Andre, the therapist placed the high-preferred food and toy within his view. We did not include an attention topography for Andre because we could not identify a high-preferred topography of attention. If the participant accepted the non-preferred food within 5 s of food presentation, then the therapist immediately delivered one piece of the high-preferred food, toy, and attention to the participant for 30 s. For Anya and George, if they accepted the non-preferred food within 5 s of food presentation and had a clean mouth at the 30-s mouth check, then the therapist immediately delivered one piece of the high-preferred food, toy, and attention for 30 s.

SEQ (combo – 2 min). During SEQ (combo – 2 min) sessions, the therapist placed a bowl of high-preferred food (i.e., 5 small pieces), toy, and picture of attention within the participant's view (see Appendix H for a visual representation). If the participant accepted the non-preferred food within 5 s of food presentation, then the therapist immediately delivered the bowl of high-preferred food, toy, and attention to the participant for 2 min. For Anya and George, if they accepted the non-preferred food within 5 s of food presentation and had a clean mouth at the 30-s mouth check, then the therapist immediately delivered the bowl of high-preferred food, toy, and attention to the participant for 2 min.

SEQ (combo) + EXT. Sequential presentation (combo) + EXT sessions were similar to SEQ (combo) sessions; however, the therapist implemented EXT (i.e., nonremoval of the spoon and re-presentation). That is, if the participant refused the non-preferred food, the therapist implemented nonremoval of the spoon in which she continued to present the non-preferred food at the participant's lips until the participant accepted the food or the 30-min session limit was reached. Regardless of participant movement, the therapist kept the spoon at the participant's lips. If the participant expelled the food, the therapist re-presented the food at the participant's lips within 3 s (i.e., presented a bite of the previously expelled food).

Fading. Once a treatment was identified as effective (i.e., greater than 90% of trials with acceptance without expulsion for at least three consecutive sessions) and the effects of the treatment were replicated either within non-preferred foods or with new non-preferred foods, we faded the reinforcement schedule for acceptance by increasing the number of consecutive bites accepted (and with a clean mouth for Anya and George) that were required for the delivery of the programmed consequence. First, we faded the reinforcement schedule to a fixed-ratio (FR) 2 in which two separate presentations of non-preferred foods were presented on each trial. On each

trial, participants were required to accept both bites within 5 s of presentation (and have a clean mouth at the 30-s mouth check for Anya and George) to access the programmed reinforcer. For treatments in which EXT was not in place, if the participant refused either bite or engaged in problem behavior within 5 s of either bite presentation, then the therapist removed the spoon or plate (Anya) for approximately 30 s, did not provide other programmed consequences, and started the next trial. For treatment in which escape EXT was in place and the participant refused either bite or engaged in problem behavior within 5 s of food presentation, then the therapist implemented nonremoval of the spoon in which she continued to present the non-preferred food at the participant's lips until the participant accepted the food or the 30-min session limit was reached. If the participant accepted every bite of the session (i.e., 10 trials with two bites), the maximum number of non-preferred bites was 20. For Annie and Anya, if they accepted every bite of the session (i.e., 20 trials with two bites), the maximum number of non-preferred bites was 40.

If the participant continued to engage in high levels of acceptance without expulsion at an FR 2 (i.e., greater than 90% of trials with acceptance without expulsion for at least three consecutive sessions), we faded the reinforcement schedule to an FR 3 in which the participant was required to take three bites on a trial to access the programmed consequence for acceptance. Thus, if the participant accepted every bite of the session (i.e., 10 trials with three bites on each trial), then the maximum number of non-preferred bites was 30. For Annie and Anya, if they accepted every bite of the session (i.e., 20 trials with three bites on each trial), then the maximum number of non-preferred bites was 60.

Experimental Preparations

We used a reversal design to evaluate the effects of different treatments for food selectivity. For all participants, we conducted an initial baseline to determine levels of acceptance without expulsion for both non-preferred and preferred foods every time we introduced new foods. Following an initial baseline, we compared the effects of different stimulus conditions (i.e., high-preferred food, high-preferred toy, high-preferred attention) using a reversal design. We counterbalanced the order of these different single stimulus conditions across participants. If we saw an effect with one of the stimulus conditions, then we reversed to baseline to determine whether we would see maintenance or reversal of effects. If effects maintained during the reversal to baseline, we identified a new set of non-preferred foods (based on the pre-treatment PSPA) to replicate effects. However, if effects did not maintain in the reversal to baseline, then we replicated our effects with the same non-preferred foods. We continued this evaluation until we evaluated all three single stimulus conditions. If any conditions were effective and we replicated their effects, then we faded the reinforcement schedule.

If we did not obtain an effect with a single stimulus condition, then we combined the stimuli to evaluate the effects of a condition in which there was a greater magnitude of reinforcement in the form of access to multiple preferred stimuli. If we saw an effect with the combination of stimuli, then we used a similar evaluation in which we reversed to baseline and attempted to replicate our effects with either the same or new non-preferred foods, depending upon whether treatment effects maintained in the reversal to baseline. If this treatment was effective and we replicated effects, then we faded the reinforcement schedule. If we did not obtain an effect with the combined stimulus condition, then we combined the stimuli and

delivered them for 2 min to evaluate the effects of a condition in which there was also a greater magnitude of reinforcement in the form of increased access duration. If we saw an effect with this intervention, then we attempted to replicate our effects with either the same or new foods. If this treatment was effective and we replicated effects, then we faded the reinforcement schedule. If we did not obtain an effect with the combined stimulus condition with a longer reinforcer access duration, then we combined the stimuli and implemented escape EXT. If we saw an effect with this treatment, then we used a similar reversal design to replicate our effects. If this condition was effective and we replicated effects, then we faded the reinforcement schedule.

Social Validity

We developed the Food Selectivity Questionnaire (Appendix I) to assess social validity and potential generalization effects. At the end of the evaluation for each participant, the primary investigator gave the participant's caregiver the questionnaire to complete. Questions assessed the extent to which the caregiver perceived changes in his or her child's feeding behaviors, his or her satisfaction with the changes, and whether he or she would like to implement the procedures at home or recommend the procedures to another parent. Because caregivers frequently received progress reports on their child's progression through the study and written descriptions of the procedures used in the study, caregivers were familiar with the procedures. Scores on the questionnaire were recorded on a Likert scale from 1 to 5 (*strongly disagree* to *strongly agree*), with higher scores indicating stronger agreement.

Results

Figures 1, 3, 5, 7, 9, 11, 13, and 15 depict results of the treatment evaluation for individual participants. The top graph of these figures depicts the percentage of trials with acceptance without expulsion, and the bottom graph of these figures depicts the percentage of

trials with problem behavior. Figures 2, 4, 6, 8, 10, 12, 14, and 16 depict data from the pre- and post-treatment PSPAs for individual participants, which we conducted prior to (pre-treatment PSPA) and following (post-treatment PSPA) fading or baseline in which we observed high levels of maintenance of acceptance without expulsion.

Results for six (Anya, Harold, Annie, George, Andre, and Gaston) of the eight participants showed increased acceptance without expulsion of non-preferred foods with sequential presentation without escape EXT. Of these six participants, three (Anya, Harold, and Annie) showed increased acceptance without expulsion of non-preferred foods with single, high-preferred stimulus (toy, food, or both). Figures 1 and 2 depict treatment evaluation data and pre- and post-treatment PSPA for Anya. The top panel of Figure 2 depicts data for the first pre-treatment PSPA, which shows that Cheetos® and Ritz Crackers were the two high-preferred foods and pineapple, peach, and mandarin orange were non-preferred foods. Therefore, we used these foods in the first treatment evaluation. Figure 1 shows that during the first baseline, Anya engaged in high levels of acceptance without expulsion and low levels of problem behavior on trials in which the therapist presented high-preferred food, whereas she engaged in zero levels of acceptance without expulsion and high levels of problem behavior (mostly escape behavior and vocalizations) on trials in which the therapist presented non-preferred foods. Next, we implemented SEQ (F) in which Anya received a high-preferred food contingent upon acceptance of non-preferred food. Following two sessions, Anya began to engage in increased levels of acceptance without expulsion of non-preferred foods that maintained over time. Additionally, Anya engaged in less problem behavior. When we faded the schedule of reinforcement to an FR 2 and an FR 3, treatment effects maintained. Next, we conducted a post-treatment PSPA (Figure 2; top panel) to determine whether there were any shifts in preference of previously preferred

and non-preferred foods or whether she at least began choosing previously non-preferred foods. Results show that Anya selected and consumed two of her previously non-preferred foods (pineapple and peach) that she did not select in her pre-treatment PSPA. In fact, peach displaced a food (animal crackers) that she selected on approximately 60% of trials in the pre-treatment PSPA.

For Anya, we conducted a new pre-treatment PSPA (Figure 2; bottom panel) with the top three foods (Cheetos®, Ritz Crackers, and peach) from the previous post-treatment PSPA and three additional items reported to be non-preferred foods (grape, strawberry, and blueberry). Based on these results, we used the top high-preferred food items (Cheetos® and Ritz Crackers) and the three non-preferred foods in relevant subsequent phases. During the second baseline (Figure 1), we made a change to the procedures for Anya in that we began implementing pre-session exposure to the contingencies and stating session contingencies to aid in discrimination of programed contingencies across sessions. During this phase, Anya displayed similar patterns of responding as in the previous baseline. That is, she engaged in high levels of acceptance without expulsion and low levels of problem behavior on trials in which the therapist presented the high-preferred food, whereas she engaged in low levels of acceptance without expulsion and low to moderate levels of problem behavior (mostly negative vocalizations) on trials in which the therapist presented non-preferred foods. Next, we implemented SEQ (T), and Anya initially engaged in high levels of acceptance without expulsion; however, she began to engage in packing in which she would hold the food in her mouth for the duration of session and spit the food out following session. Because of this, we implemented a clean-mouth procedure for all subsequent sessions in which the therapist delivered the reinforcer contingent upon acceptance without expulsion *and* clean mouth. Following this change in the contingency, there was a

decreasing trend in acceptance without expulsion and clean mouth, suggesting SEQ (T) was ineffective. Next, we implemented SEQ (A), and Anya engaged in variable levels of acceptance without expulsion and clean mouth and moderate levels of problem behavior (mostly escape behavior, negative vocalizations, and disruptive behavior), suggesting SEQ (A) was ineffective. Next, we again implemented SEQ (F) and replicated our previous effects (i.e., high levels of acceptance without expulsion, and now clean mouth) and low levels of problem behavior (mostly negative vocalizations). Next, when we reversed to baseline (BL2) with the same high-preferred and non-preferred foods from the previous baseline, Anya engaged in high levels of acceptance without expulsion and clean mouth of the high-preferred food and variable levels of acceptance without expulsion and clean mouth of non-preferred foods. Problem behavior (mostly negative vocalizations) maintained at relatively low levels across high-preferred and non-preferred food trials. Overall, our results suggest that SEQ (F) was effective for increasing acceptance without expulsion and clean mouth and maintaining low levels of problem behavior even when the schedule of reinforcement was faded. Next, we conducted another post-treatment PSPA (Figure 2, bottom panel), and results show that Anya selected and consumed one previously non-preferred food (blueberry) that she did not select in the pre-treatment PSPA and another previously non-preferred food (grape) at higher levels than in the pre-treatment PSPA. In fact, Anya selected grape at the same percentage as peach (60% of trials). Anya was one of our initial participants; therefore, some of our procedures were different with her with respect to pre-session exposure, fading the reinforcement schedule, and replicating our results.

Figures 3 and 4 depict treatment evaluation data and pre- and post-treatment PSPAs for Harold, respectively. The top panel of Figure 4 depicts the data for the first pre-PSPA, which shows that deli turkey and rice cakes were the two high-preferred foods and meatloaf, BBQ

meatballs, and tilapia fillets were non-preferred foods. Therefore, we used these foods in the first treatment evaluation. Figure 3 shows that during the first baseline (BL1), Harold engaged in high levels of acceptance without expulsion and low levels of problem behavior on trials in which the therapist presented high-preferred food, whereas, he engaged in low levels of acceptance without expulsion and moderate levels of problem behavior (mostly escape behavior and negative vocalizations) on trials in which the therapist presented non-preferred foods. During the next two phases (SEQ [A] and SEQ [F]), Harold continued to engage in low levels of acceptance without expulsion of non-preferred foods and moderate levels of problem behavior (mostly escape behavior), suggesting these treatments were ineffective. Next, when we implemented SEQ (T), Harold began to engage in high levels of acceptance without expulsion of the non-preferred foods, as well as low levels of problem behavior. Next, when we reversed to baseline (BL1) with the same high-preferred and non-preferred foods from the previous baseline, we showed maintained effects (i.e., high levels of acceptance without expulsion of non-preferred foods and low levels of problem behavior). Following these results, we conducted a post-treatment PSPA (Figure 4; top panel), which showed that Harold selected and consumed two of his previously non-preferred foods (meatloaf and BBQ meatballs) that he did not select in the pre-treatment PSPA.

We conducted a new pre-treatment PSPA (Figure 4; bottom panel) with the top three foods (deli turkey, rice cakes, and breaded chicken) from the previous post-treatment PSPA and three additional items reported to be non-preferred foods (hamburger, spaghetti [meat], and carnitas). Based on these results, we used the top two high-preferred food items (deli turkey and rice cakes) and the three non-preferred foods in relevant subsequent phases. During the third baseline (Figure 3; BL2), Harold engaged in high levels of acceptance without expulsion and low

levels of problem behavior on trials in which high-preferred food was presented, whereas he engaged in low levels of acceptance without expulsion and moderate levels of problem behavior (mostly escape behavior) on trials in which non-preferred foods were presented. Next, we again implemented SEQ (T), and Harold engaged in low levels of acceptance without expulsion and moderate levels of problem behavior (mostly escape behavior); however, during these sessions, he was more likely to accept carnitas (CS) but did not accept spaghetti (SP) or hamburger (HB). Next, because Harold engaged in acceptance without expulsion of the carnitas, we removed carnitas and presented spaghetti and hamburger during sessions, and Harold continued to engage relatively low levels of acceptance without expulsion and moderate to high levels of problem behavior (mostly escape behavior, negative vocalizations, and disruptive behavior). However, during these sessions, he was more likely to accept spaghetti. Next, because Harold engaged in acceptance without expulsion of the spaghetti, we removed spaghetti and presented hamburger during sessions, and Harold engaged in high levels of acceptance without expulsion and low to zero levels of problem behavior. When we again presented all three non-preferred foods in sessions, Harold engaged in high levels of acceptance without expulsion and low levels of problem behavior even when we faded the schedule of reinforcement to an FR 2 and an FR 3. Overall, our treatment evaluation results suggest that SEQ (T) was effective for increasing acceptance without expulsion and maintaining low levels of problem behavior. Following fading with the new set of non-preferred foods, we conducted a post-treatment PSPA (Figure 4, bottom panel), and results show that Harold selected and consumed two previously non-preferred foods (hamburger and spaghetti [meat]) that he never selected in the pre-treatment PSPA.

Figures 5 and 6 depict treatment evaluation data and pre- and post-treatment PSPA for Annie, respectively. Figure 6 depicts the data for the pre-treatment PSPA, which shows that

Goldfish® Pretzel and cheddar popcorn were the two high-preferred foods and cauliflower, tomato, and carrot were non-preferred foods. Therefore, we used these foods in the treatment evaluation. Figure 5 shows that during the first baseline, Annie engaged in high levels of acceptance without expulsion and low levels of problem behavior (mostly escape behavior, negative vocalizations, and disruptive behavior) on trials in which the therapist presented high-preferred food, whereas she engaged in zero levels of acceptance without expulsion and high levels of problem behavior (mostly escape behavior, negative vocalizations, and disruptive behavior) on trials in which the therapist presented non-preferred food. Next, when we implemented SEQ (T), Annie engaged in moderate levels of acceptance without expulsion of the non-preferred foods and moderate to high levels of problem behavior (mostly escape behavior, negative vocalizations, and disruptive behavior). Specifically, she accepted tomato (TM) at relatively high levels but never accepted cauliflower (CF) or carrot (CT). Next, when we implemented SEQ (A), Annie engaged in low levels of acceptance without expulsion of the non-preferred foods and high levels of problem behavior (mostly escape behavior and disruptive behavior). Next, when we implemented SEQ (F), we saw similar results to the SEQ (T) condition in that Annie accepted tomato (TM) at relatively high levels but rarely accepted cauliflower and carrot. Next, we implemented SEQ (T) again; however, we removed tomato and presented only cauliflower and carrot. Annie engaged in moderate levels of acceptance without expulsion and moderate levels of problem behavior (mostly escape behavior, negative vocalizations, and disruptive behavior); however, she accepted cauliflower at relatively high levels. Next, we removed cauliflower and presented only carrot during sessions, and Annie engaged in zero levels of acceptance without expulsion of the carrot and high levels of problem behavior (mostly escape behavior and disruptive behavior), suggesting SEQ (T) was ineffective

for carrot. Next, we again implemented SEQ (F) but without tomato (only cauliflower and carrot), and similar to results with SEQ (T), Annie only accepted cauliflower at high levels. Next, we again removed cauliflower and presented only carrot during SEQ (F), and Annie engaged in high levels of acceptance without expulsion of the carrot and zero levels of problem behavior. Next, when we again implemented SEQ (T) with carrot only, Annie continued to engage in high levels of acceptance without expulsion and low levels of problem behavior, although slightly more variable than in SEQ (F). Next, we again implemented SEQ (A) and presented carrot only, treatment effects did not continue. Because Annie engaged in the highest level of acceptance without expulsion of carrot with SEQ (F), we implemented SEQ (F) with all three non-preferred foods (carrot, cauliflower, and tomato). Similar to previous conditions, Annie engaged in moderate levels of acceptance without expulsion and moderate to high levels of problem behavior (mostly escape behavior, negative vocalizations, and disruptive behavior) but with high levels of acceptance of tomato only. Because Annie only accepted one food when we presented all three foods together, we wanted to see if we could increase acceptance for all three foods by using a multielement design in which one non-preferred was presented during each session. During sessions when we presented cauliflower and tomato at an FR 1 schedule of reinforcement, Annie engaged in high levels of acceptance without expulsion and low levels of problem behavior; however, when we presented carrot at an FR 1, Annie engaged in zero levels of acceptance without expulsion and high levels of problem behavior (mostly escape behavior, negative vocalizations, and disruptive behavior). Next, when we faded the schedule of reinforcement to an FR 2 with both cauliflower and tomato, treatment effects maintained during sessions in which we presented tomato; however, following two sessions treatment effects did not maintain for cauliflower. Next, we faded the schedule of reinforcement to an FR 3 for just

tomato, and treatment effects maintained. Next, we conducted consecutive sessions of cauliflower only then carrot only under an FR1 schedule, and treatment effects were recaptured under this dense schedule. Overall, our treatment evaluation results suggest that SEQ (F) and SEQ (T) were effective for increasing acceptance without expulsion and maintaining low levels of problem behavior for all three non-preferred foods; however, the non-preferred foods needed to be presented individually for increases in all three to occur. Furthermore, we were only able to fade with tomato; effects only maintained for cauliflower and carrot under an FR1 schedule. Following these results, we conducted a post-treatment PSPA (Figure 6), and results show that Annie selected and consumed two previously non-preferred foods (cauliflower and tomato) that had not been selected in the pre-treatment PSPA.

For three (George, Andre, and Gaston) of the six participants that showed treatment effects with sequential presentation without escape EXT, effects occurred with a combination of high-preferred stimuli (i.e., toy, food, and attention). Figures 7 and 8 depict treatment evaluation data and pre- and post-treatment PSPAs for George, respectively. The top panel of Figure 8 depicts the data for the first pre-treatment PSPA, which shows that chips and chocolate bunny grahams were the two high-preferred foods and green bean, corn, and carrot were non-preferred foods. Therefore, we used these foods in the first treatment evaluation. Figure 7 shows that during the first baseline (BL1), George engaged in high levels of acceptance without expulsion and low levels of problem behavior on trials in which the therapist presented high-preferred food, whereas he engaged in zero levels of acceptance without expulsion and high levels of problem behavior (mostly escape behavior and negative vocalizations) on trials in which the therapist presented non-preferred foods. In the next three phases in which we implemented SEQ (T), SEQ (F), and SEQ (A), treatment effects did not occur; however, low levels of problem

behavior occurred in some sessions. Also, during SEQ (F), George would often accept non-preferred foods, gain access to the programmed reinforcer, then expel the non-preferred food at various points throughout the session. Because of this, we implemented a clean-mouth procedure for all subsequent sessions in which the therapist delivered the reinforcer contingent upon acceptance without expulsion *and* clean mouth. Next, we implemented SEQ (combo) in which George received a high-preferred food (chips or chocolate bunny grahams), a high-preferred toy (pins and needles or bubble gun), and a high-preferred attention (chase) contingent upon acceptance without expulsion and clean mouth of non-preferred food. During this phase, George engaged in high levels of acceptance without expulsion and clean mouth and low to zero levels of problem behavior (mostly escape behavior). We replicated these effects in a reversal to baseline (BL1) and SEQ (combo) phases, even when the schedule of reinforcement was thinned to an FR2 and FR 3. Following these results, we conducted a post-treatment PSPA (Figure 8; top panel), and results show that George selected and consumed two of his three previously non-preferred foods (green bean and carrot) that he did not select in the pre-treatment PSPA. In fact, green bean displaced a food item (chips) that he previously selected on approximately 83.3% of trials.

We conducted a new pre-treatment PSPA (Figure 8; bottom panel) with the top three foods (chocolate bunny grahams, Honey Bunches of Oats®, and green bean) from the previous post-treatment PSPA and three additional items reported to be non-preferred foods (mandarin orange, grape, and blueberry). Based on these results, we used the top high-preferred food items (chocolate bunny grahams and Honey Bunches of Oats®) and the three non-preferred foods in relevant subsequent phases. During the third baseline (Figure 7; BL2), we replicated previous baseline effects. Next, when we again implemented SEQ (combo), George engaged in moderate

levels of acceptance without expulsion and clean mouth and zero levels of problem behavior. Specifically, he was accepting orange at high levels but did not accept grape or blueberry. Next, we removed orange and presented grape and blueberry during sessions, and George engaged in moderate levels of acceptance without expulsion and clean mouth. However, George reliably accepted grape but did not accept blueberry. Next, when we removed grape and presented blueberry only during sessions, George engaged in high levels of acceptance without expulsion and clean mouth and zero levels of problem behavior. Next, when we again presented all three non-preferred foods, we replicated high levels of acceptance without expulsion and zero levels of problem behavior. Next, when we reversed to baseline (BL2), treatment effects maintained with non-preferred foods. Overall, our treatment evaluation results suggest that SEQ (combo) was effective for increasing acceptance without expulsion and clean mouth and maintaining low levels of problem behavior, even when we faded the schedule of reinforcement. Following baseline, we conducted a post-treatment PSPA (Figure 8, bottom panel), and results show that George selected and consumed all three of his previously non-preferred foods (mandarin orange, grape, and blueberry) that he did not select in the pre-treatment PSPA.

Figures 9 and 10 depict treatment evaluation data and pre- and post-treatment PSPAs for Andre, respectively. The top panel of Figure 10 depicts the data for the pre-treatment PSPA, which shows that Starbursts® and cheddar rice cakes were the two high-preferred food items and green bean, corn, and cucumber were non-preferred foods. Therefore, we used these foods in the first treatment evaluation. Figure 9 shows that during the first baseline, Andre engaged in high levels of acceptance without expulsion and low levels of problem behavior on trials in which the therapist presented high-preferred food, whereas he engaged in zero levels of acceptance without expulsion and high levels of problem behavior (mostly escape behavior, negative vocalizations,

and disruptive behavior) on trials in which the therapist presented non-preferred foods. Next, we implemented SEQ (F) and SEQ (T) phases, and Andre engaged in zero levels of acceptance without expulsion and high levels of problem behavior (mostly escape behavior, negative vocalizations, and disruptive behavior). Next, we implemented SEQ (combo), and Andre engaged in moderate levels of acceptance without expulsion and moderate levels of problem behavior (mostly escape behavior, negative vocalizations, and disruptive behavior). Specifically, he accepted green bean at high levels but did not accept cucumber or corn. Next, when we removed green bean and presented cucumber and corn during sessions, he engaged in moderate levels of acceptance without expulsion and moderate levels of problem behavior (mostly escape behavior, negative vocalizations, and disruptive behavior); however, he accepted cucumber at high levels. Next, when we removed cucumber and presented only corn during sessions, he engaged in zero levels of acceptance without expulsion and high levels of problem behavior (mostly escape behavior, negative vocalizations, and disruptive behavior). Because Andre did not accept the corn, we removed corn from sessions and presented just green bean and cucumber, and we recaptured previous treatment effects. Next, we replicated those effects in our reversal to baseline and SEQ (combo) without corn. However, when we faded the schedule of reinforcement to an FR 2, Andre engaged in decreasing levels of acceptance without expulsion but continued low levels of problem behavior. Because of this, we faded the schedule of reinforcement back to an FR 1, and recaptured our treatment effects. When we again faded to an FR 2, we observed maintained treatment effects. However, when we faded the schedule of reinforcement to an FR 3, we again saw a disruption in effects. Therefore, we faded the schedule of reinforcement back to an FR 2 but were unable to recapture our previous treatment effects. Therefore, we again went back to an FR 1 and recaptured treatment effects. Overall, our

treatment evaluation results suggest that SEQ (combo) was effective for increasing acceptance without expulsion and maintaining low levels of problem behavior for two non-preferred foods but only at an FR 1 schedule of reinforcement. Following fading, we conducted a post-treatment PSPA (Figure 10), and results show that Andre selected and consumed two of his three previously non-preferred foods (green bean and cucumber) that he never selected in the pre-treatment PSPA.

Figures 11 and 12 depict treatment evaluation data and pre- and post-treatment PSPAs for Gaston, respectively. Figure 12 depicts the data for the pre-treatment PSPA, which shows that fruit snacks and Fruit Loops® were the two high-preferred food items and cucumber, corn, and green bean were non-preferred foods. Therefore, we used these foods in the first treatment evaluation. Figure 11 shows that during the first baseline, Gaston engaged in moderate to high levels of acceptance without expulsion and moderate to low levels of problem behavior on trials in which the therapist presented high-preferred food, whereas he engaged in zero levels of acceptance without expulsion and high levels of problem behavior (mostly escape behavior) on trials in which the therapist presented non-preferred foods. Next, when we implemented SEQ (A), SEQ (F), and SEQ (T) phases, Gaston engaged in zero levels of acceptance without expulsion and high levels of problem behavior (mostly escape behavior and negative vocalizations). Next, when we implemented SEQ (combo), Gaston engaged in moderate levels of acceptance without expulsion and moderate levels of problem behavior (mostly escape behavior). Specifically, during these sessions, he accepted cucumber at high levels but did not accept corn or green bean. Next, when we removed cucumber and presented corn and green bean, Gaston engaged in zero levels of acceptance without expulsion and high levels of problem behavior (mostly escape behavior and disruptive behavior). Next, when we reintroduced

cucumber and presented all three non-preferred foods, we again observed moderate levels of acceptance without expulsion of non-preferred foods and moderate to high levels of problem behavior (mostly escape behavior, negative vocalizations, and disruptive behavior). Although acceptance of cucumber was high in some sessions, these effects did not maintain in this phase. Next, we implemented SEQ (combo – 2 min) in which Gaston received a bowl of high-preferred food (fruit snack or Fruit Loops®), a high-preferred toy (bubble gun or furry ball), and a high-preferred topography of attention (conversation or praise) for 2 min contingent upon acceptance of non-preferred food. During this phase, Gaston again mostly accepted without expulsion cucumber and engaged in moderate to high levels of problem behavior (mostly escape behavior). Next, when we removed cucumber and presented corn and green bean during SEQ (combo – 2 min) sessions, Gaston engaged in zero levels of acceptance without expulsion and high levels of problem behavior (mostly escape behavior, negative vocalizations, and disruptive behavior). Therefore, in our next phase, we again presented cucumber only and observed high levels of acceptance without expulsion and zero levels of problem behavior. Next, when we reversed to baseline with the same high-preferred food from the previous baseline and cucumber only, Gaston engaged in high levels of acceptance without expulsion and low to zero levels of problem behavior (mostly escape behavior) on all trials. Following baseline, we conducted a post-treatment PSPA (Figure 12; top panel) and showed that Gaston accepted and consumed one of his previously non-preferred foods (cucumber), which he did not select in the pre-treatment PSPA.

The post-treatment PSPA (Figure 12; top panel) served as the pre-treatment PSPA for Gaston's subsequent treatment evaluation. We used the top high-preferred food items (fruit snacks and grapes) and the same two non-preferred foods (corn and green bean) in relevant

subsequent phases. During the third baseline (Figure 11; BL No CC), we replicated previous baseline outcomes. Next, when we implemented SEQ (combo) + EXT, Gaston engaged in high levels of acceptance without expulsion of the non-preferred foods and low levels of problem behavior. We replicated these effects in subsequent baseline (BL No CC) and SEQ (combo) + EXT phases. However, when we faded the schedule of reinforcement to an FR 2, Gaston engaged in variable levels of acceptance without expulsion and increasing levels of problem behavior (mostly escape behavior, vocalizations, and disruptive behavior). Because of the decrement in treatment effects, we went back to an FR 1 schedule, and recaptured treatment effects. Overall, our treatment evaluation results suggest that SEQ (combo) was effective for increasing acceptance without expulsion and maintaining low levels of problem behavior for one non-preferred food. SEQ (combo) + EXT was effective for increasing acceptance without expulsion and maintaining low levels of problem behavior for two non-preferred foods at a dense schedule; however, we were unable to fade the schedule of reinforcement. Following fading, we conducted a post-treatment PSPA (Figure 10), and results show that Gaston did not select or consume the two previously non-preferred foods (corn and green bean) from the pre-treatment PSPA.

For two (Valerie and Margot) of the eight participants, sequential presentation without escape EXT was not effective. For both participants, a combination of high-preferred stimuli (i.e., toy, food, and attention) with escape EXT (i.e., nonremoval of the spoon and re-presentation) was necessary. However, following this history of escape EXT, both participants increased acceptance without expulsion of a new set of non-preferred foods with a combination of high-preferred stimuli (i.e., toy, food, and attention) *without* escape EXT. Figures 13 and 14 depict treatment evaluation data and pre- and post-treatment PSPAs for Valerie, respectively.

The top panel of Figure 14 depicts the data for the first pre-treatment PSPA, which shows that popcorn and potato chip were the two high-preferred food items and green bean, corn, and pea were non-preferred foods. Therefore, we used these foods in the first treatment evaluation. The top panel of Figure 13 shows that during the first baseline (BL1), Valerie engaged in high levels of acceptance without expulsion and low levels of problem behavior on trials in which the therapist presented high-preferred food, whereas she engaged in low levels of acceptance and high levels of problem behavior (mostly escape behavior) on trials in which the therapist presented non-preferred foods. In the next three phases, when we implemented SEQ (A), SEQ (T), and SEQ (F), Valerie engaged in zero levels of acceptance without expulsion and moderate to high levels of problem behavior (mostly escape behavior). Next, when we implemented SEQ (combo) and SEQ (combo – 2 min), we continued to see those effects. However, when we implemented SEQ (combo) + EXT, Valerie engaged in increased levels of acceptance without expulsion that maintained at high levels and low levels of problem behavior. We replicated these effects in a subsequent reversal to baseline and SEQ (combo) + EXT with these same foods, and treatment effects maintained even as we faded the schedule of reinforcement to an FR 2 and FR 3. Following these results, we conducted a post-treatment PSPA (Figure 14; top panel), and results show that Valerie accepted and consumed all three of her previously non-preferred foods that she did not select in the pre-treatment PSPA. In fact, all three foods displaced a food item (popcorn) that she previously selected on approximately 100% of trials. Additionally, green bean displaced a food item (Cheerios™) that she previously selected on 60% of trials.

We conducted a new pre-treatment PSPA (Figure 14; bottom panel) with the top three foods (potato chip, Cheerios™, green bean) from the previous post-treatment PSPA and three additional items reported to be non-preferred foods (carrot, broccoli, cucumber). Based on these

results, we used the top high-preferred food items (potato chip and Cheerios™) and the three non-preferred foods in relevant subsequent phases. During the third baseline (Figure 13; BL2), we replicated previous baseline results. Next, we decided to see if we could get effects with SEQ (combo) after Valerie had a history with EXT. During this phase, Valerie engaged in high levels of acceptance without expulsion (albeit a bit more variable compared to previous phases) and low to zero levels of problem behavior (mostly escape behavior). We replicated these results in our reversal to baseline and SEQ (combo) phases, and our treatment effects maintained even as the schedule of reinforcement was faded to an FR 2 and FR 3. Overall, our treatment evaluation results suggest that SEQ (combo) + EXT was effective for increasing acceptance without expulsion and maintaining low levels of problem behavior; however, following a history of EXT, SEQ (combo) was effective for increasing acceptance without expulsion and maintaining low levels of problem behavior. Following these results, we conducted a post-treatment PSPA (Figure 14; bottom panel), and results show that Valerie accepted and consumed one of her previously non-preferred foods (cucumber) that she never selected in the pre-treatment PSPA and one other non-preferred food (carrot) at somewhat higher levels than in the pre-treatment PSPA.

Figures 15 and 16 depict treatment evaluation data and pre- and post-treatment PSPAs for Margot, respectively. The top panel of Figure 16 depicts the data for the first pre-treatment PSPA, which shows that Oreos® and Little Debbie™ Honey Bun were the two high-preferred food items and strawberry, grape, and blueberry were non-preferred foods. Therefore, we used these foods in the first treatment evaluation. The top panel of Figure 15 shows that during the first baseline (BL1), Margot engaged in high levels of acceptance without expulsion and low levels of problem behavior on trials in which the therapist presented high-preferred food,

whereas she engaged in low to zero levels of acceptance and high levels of problem behavior (mostly escape behavior, negative vocalizations, disruptive behavior) on trials in which the therapist presented non-preferred foods. In the next phases, results show that SEQ (F), SEQ (A), SEQ (T), SEQ (combo), and SEQ (combo – 2 min) were ineffective. However, during SEQ (combo) + EXT, Margot engaged in increased levels of acceptance without expulsion that maintained at high levels and low to zero levels of problem behavior. We observed maintained effects when we reversed to baseline (BL1) with the same high-preferred and non-preferred foods from the previous baseline. Following these results, we conducted a post-treatment PSPA (Figure 16; top panel), and results show that Margot accepted and consumed two of her three previously non-preferred foods (strawberry and grape) that she did not accept in the pre-treatment PSPA.

We conducted a new pre-treatment PSPA (Figure 16; middle panel) with the top three foods (Oreos®, Little Debbie™ Honey Bun, and Ritz Cheese Crackers) from the previous post-treatment PSPA and three additional items reported to be non-preferred foods (carrot, green bean, and broccoli). Based on these results, we used the top high-preferred food items (Little Debbie™ Honey Bun and Ritz Cheese Crackers) and the three non-preferred foods in relevant subsequent phases. During the third baseline (Figure 15; BL2) and subsequent SEQ (combo) + EXT phases, we replicated our initial effects. In addition, treatment effects maintained under SEQ (combo) + EXT even when we increased the schedule of reinforcement to an FR2 and FR3. Following these results, we conducted a post-treatment PSPA (Figure 16; middle panel), and results show that Margot accepted and consumed two of her three previously non-preferred foods (carrot and green bean) that were not chosen in the pre-treatment PSPA.

We conducted a new pre-treatment PSPA (Figure 16; bottom panel) with the top three foods (Little Debbie™ Honey Bun, Ritz Cheese Crackers, and Oreos®) from the previous post-treatment PSPA and three additional items reported to be non-preferred foods (cucumber, pea, cauliflower). Although Margot accepted and consumed cucumber and pea on 40% and 20% of trials, respectively, she often refused these foods and engaged in disruptive behavior when the therapist presented them on a spoon. Thus, we included them in the subsequent treatment evaluation. Based on these results, we used the top high-preferred food items (Little Debbie™ Honey Bun and Ritz Cheese Crackers) and the three non-preferred foods in relevant subsequent phases. During the fourth baseline (Figure 15; BL3), Margot again engaged in high levels of acceptance without expulsion and low to zero levels of problem behavior on trials in which the therapist presented high-preferred food, whereas, she engaged in low to zero levels of acceptance and high levels of problem behavior (mostly escape behavior, negative vocalizations, and disruptive behavior) on trials in which the therapist presented non-preferred foods. Similar to our logic with Valerie, we wanted to see if we could get effects without EXT after Margot had a history with EXT. Therefore, we implemented SEQ (combo), and obtained similar treatment effects to those observed in previous SEQ (combo) + EXT conditions. We replicated these results in a reversal to BL 3 and SEQ (combo) conditions. Furthermore, treatment effects were maintained as we increased the schedule of reinforcement to an FR 2 and FR 3. Overall, our treatment evaluation results suggest that SEQ (combo) + EXT was effective for increasing acceptance without expulsion and maintaining low levels of problem behavior even under leaner schedules; however, following a history of EXT, SEQ (combo) was effective for increasing acceptance without expulsion and maintaining low levels of problem behavior also under leaner schedules. Following these results, we conducted a post-treatment PSPA (Figure 16; bottom

panel), and results show that Margot selected and consumed one previously non-preferred food (cauliflower) that she did not select in her pre-treatment PSPA and selected and consumed her other two non-preferred foods at similar (pea) or somewhat lower levels (cucumber) than in the pre-treatment PSPA.

Social Validity

The overall results of the Food Selectivity Questionnaire are depicted in Table 4. Of the eight caregivers, seven returned the Food Selectivity Questionnaire. Caregivers responded at a mean score of 3.6 (range, 2-5) for "My child is more likely to eat previously disliked foods." Caregivers responded at a mean score of 3.7 (range, 2-5) for "My child is more likely to eat or try new foods." Caregivers responded at a mean score of 3.4 (range, 2-4) for "There has been an associated decrease in problem behavior during meals." Caregivers responded at a mean score of 3.6 (range, 2-5) for "There has been an associated decrease in whining and crying during meals." Caregivers responded at a mean score of 4 (range, 2-5) for "I feel more comfortable taking my child to restaurants and social events." Caregivers responded at a mean score of 3.7 (range, 2-5) for "Mealtimes have become more enjoyable." Caregivers responded at a mean score of 4.1 (range, 2-5) for "I am satisfied with the changes I've seen in my child's eating behavior." Caregivers responded at a mean score of 3.6 (range, 2-5) for "I noticed changes in my child's eating behavior at home during treatment." Caregivers responded at a mean score of 4.4 (range, 3-5) for "I would like to implement these procedures during mealtimes at home." Caregivers responded at a mean score of 4.9 (range, 4-5) for "I would recommend this treatment to other parents."

Discussion

The current study extends previous research by evaluating the effects of different parameters of reinforcement (i.e., reinforcer type and magnitude) for treating food selectivity of young children using sequential presentation in the absence of escape EXT. For six of eight participants, sequential presentation without EXT was an effective treatment for at least some of their non-preferred foods. For three (Anya, Harold, and Annie) of these participants, SEQ with a single high-preferred stimulus was an effective treatment for all non-preferred foods. For Anya, a high-preferred food was effective. For Harold, a high-preferred toy was effective. For Annie, both a high-preferred food and toy were effective. For the three other participants (George, Andre, and Gaston), SEQ with a combination of high-preferred stimuli was an effective treatment. For one participant (George), SEQ (combo) was effective for all non-preferred foods; however, for the other two participants, SEQ (combo) was effective for two (Andre) or one non-preferred foods (Gaston). For the remaining two participants (Valerie and Margot) and for two non-preferred foods for Gaston, the addition of EXT was necessary for initial treatment effects. Furthermore, we effectively faded the reinforcement schedule under effective treatments for five out of eight participants. Finally, for all participants, they began selecting and consuming at least one previously non-preferred food during post-treatment PSPAs.

The efficacy of sequential presentation without EXT for most participants is a major finding of the current study. With the delivery of either a single high-preferred stimulus (food or toy) or combined high-preferred stimuli (food, toy, and attention), treatment effects occurred for at least some non-preferred foods. There are several reasons why these effects may have occurred. One possibility is the reinforcers programmed for acceptance were higher quality (high-preferred stimuli) or higher quality and magnitude (combination of high-preferred stimuli)

than those available for refusal or problem behavior (30-s escape), which may have shifted allocation of responding to the more appropriate alternative (acceptance). This pattern of responding would be consistent with the matching law (Baum, 1974; Hernstein, 1961) in that the relative rate of responding toward each response approximates the relative rate of reinforcement available for that response. Furthermore, previous applied research has demonstrated that participants may prefer positive reinforcers over negative reinforcers when both are concurrently available (e.g., DeLeon, Neidert, Anders, & Rodriguez-Catter, 2001). Thus, it is possible the addition of positive reinforcers for acceptance resulted in a more preferred and qualitatively better consequence than those for refusal.

Another possibility is that the delivery of high-preferred stimuli during treatment sessions functioned as an abolishing operation (Michael, 1982) by reducing the aversiveness of the demand context (i.e., presentation of non-preferred food) and decreasing the value of escape, thereby increasing the likelihood of acceptance. Research examining the effects of noncontingent reinforcement indicate that the delivery of positive reinforcement decreases the value of escape (e.g., Lomas, Fisher, & Kelley, 2010). Thus, it is possible the delivery of positive reinforcement within the context of sequential presentation may also decrease the value of escape. However, if this was the case in the current study, it would likely be due to the delivery of non-food reinforcers during treatment sessions given that high-preferred foods were interspersed (delivered noncontingently) with non-preferred foods during baseline conditions without therapeutic effects (at least prior to a history with an effective treatment). Finally, it is possible that sequential presentation was effective in the absence of escape EXT as the delivery of 30 s of escape functioned as punishment for refusal (Ingvarsson, Kahng, & Hausman, 2008; Payne & Dozier, 2013). That is, following the introduction of the delivery of positive reinforcers

for acceptance, the delivery of 30 s of escape may have become aversive, thus decreasing the future likelihood of refusal occurring and increasing the likelihood of acceptance. In fact, some participants engaged in emotional responding during some sessions when they did not earn the high-preferred stimuli or when they were removed after access.

With respect to our evaluation of the effects of sequential presentation without EXT with single high-preferred stimuli, results suggest that high-preferred food, toys, or both were effective with three participants. Previous research has suggested the efficacy of high-preferred food as a reinforcer for non-preferred food acceptance (e.g., Cooper et al., 1999; Najdowski et al., 2003; Penrod et al., 2012); however, our results suggest that high-preferred toys may also be effective for some participants. Furthermore, our results suggest that high-preferred attention was not an effective reinforcer for non-preferred food acceptance, which suggests that attention may not be a potent reinforcer under these conditions. Our initial preference assessments suggested that this might be the case, at least with the types of attention we evaluated, given that six out of eight participants did not choose any type of attention on a high percentage of trials in our initial preference assessment.

With respect to our evaluation of the effects of sequential presentation without EXT with combined high-preferred stimuli, results suggest it was effective for at least one non-preferred food for three participants. That is, for two participants (Andre and George), the treatment was effective for only two or one non-preferred food, respectively. Although combined high-preferred stimuli were effective for these three participants, it is unclear which stimuli were necessary and sufficient. In addition, given that attention alone did not function as a reinforcer for any of the eight participants, and preference results were not necessarily robust, it is unclear whether the delivery of attention was necessary for treatment effects. In fact, we did not use

attention with Andre because we were unable to determine a high-preferred form of attention during multiple preference assessments. Researchers should continue to evaluate the effects of attention on acceptance of non-preferred food both alone and in combination to determine the necessity of this stimulus. This is particularly important given that it may be difficult to deliver some types of attention like those we evaluated in the current study during mealtime.

Sequential presentation with single and combined high-preference stimuli were ineffective for two participants (Valerie and Margot) and did not increase acceptance for all foods for another two participants (Andre and Gaston). Additionally, for the three participants (Valerie, Margot, and Gaston) with whom we evaluated sequential presentation with combined stimuli and increased reinforcer access duration, we did not observe any additional effects. That is, for Gaston, we saw similar effects to those obtained with the combined intervention, and we saw no treatment effects with Valerie and Margot. This finding is in contrast with previous research in which manipulations of magnitude of reinforcement have been effective in the treatment of problem behavior in the absence of EXT (e.g., Athens & Vollmer, 2010). In the current study, it is possible that the duration of reinforcement (2 min of access) or the magnitude of high-preferred food (5 small pieces) that we programmed was not sufficient to increase acceptance and decrease problem behavior. It is also possible the duration of access programmed in the current study was ineffective given the type of reinforcers we used (Jones, Dozier, & Neidert, 2014). For example, if the therapist delivered Fruit Loops®, bubble gun, and conversation to Gaston when he accepted a non-preferred food, it is possible that the delivery of one or more of these stimuli for 2 min was either too short or long to produce an increase in reinforcer efficacy. Furthermore, it is possible the increased duration of combined stimuli was ineffective because participants did not discriminate the increase in reinforcer access duration as

compared to the combined condition. Although we implemented pre-session exposure and description of the contingencies, it is possible results would have been different if we included additional stimuli that signaled the duration of access (e.g., timer).

Although effects were seen with most participants without EXT, it was necessary to add escape EXT to show initial treatment effects with two participants (Valerie and Margot), as well as to show treatment effects with the two non-preferred foods for which other interventions were ineffective with Gaston. Thus, manipulations in quality and magnitude did not influence their allocation of responding toward acceptance without expulsion and refusal or problem behavior with the implementation of EXT. Given we implemented escape EXT in conjunction with the delivery of combined high-preferred stimuli for acceptance, it is unknown whether we would have obtained similar results if we combined EXT with single high-preferred stimuli with these participants. This would be important to determine given that it is likely easier to implement one high-preferred stimulus as compared to three. Additionally some single stimuli are likely easier to implement (e.g., foods) as compared to others (e.g., some forms of attention or access to an interactive game).

For both Valerie and Margot, we were able to increase acceptance using a combination of stimuli without EXT following a history of escape EXT. These data suggest that it may not be necessary to program escape EXT to increase acceptance of other foods following a history of escape EXT. Stimulus control (McIlvane & Dube, 1992; Sidman & Stoddard, 1967) may explain this effect. That is, the stimuli we programmed during sessions (e.g., room, serving utensils, therapists, reinforcers) may have acquired and exerted stimulus control over the participants' behavior such that participants were more likely to engage in acceptance in the presence of those stimuli. If so, then escape EXT would no longer be necessary. That is, either

specific stimuli or the combination of stimuli acquired discriminative properties that subsequently signaled the availability of reinforcement, as well as the potential implementation of escape EXT.

An interesting pattern of responding that occurred in the current study was that five (Harold, Annie, George, Andre, and Gaston) of the six participants for whom sequential presentation without EXT was effective accepted only one of the three non-preferred foods during one or several treatment evaluations. For example, if carrot, pea, and cucumber were all non-preferred foods, then under particular treatment conditions they would only reliably accept pea. For four of these participants (Harold, Annie, George, and Andre), as previously non-preferred foods were accepted, and we removed them from sessions, they would then reliably accept one of the two remaining non-preferred foods. For three of these participants (Harold, Annie, and George), when sessions were conducted with the one non-preferred food that had not been accepted in previous sessions, they would accept the remaining non-preferred food. Finally, for two of these participants (Harold and George), following treatment effects for each food individually (as previously accepted foods were removed), we observed treatment for all three non-preferred foods when they were again combined during sessions. This pattern of responding in which only one non-preferred food was accepted across phases may have been an artifact of our procedures. That is, during all sessions, three non-preferred foods were presented in a quasi-random order, such that acceptance of three different non-preferred foods, some of which may be more or less preferred than others, was necessary to maximize reinforcement. However, some participants may have responded by accepting the least aversive of the three stimuli to access at least some reinforcers. Our data in which we conducted sessions with single

non-preferred foods in a multielement design and in consecutive sessions suggest this might be the case.

In addition to the direct treatment effects, we also showed that for the majority of participants, that they began selecting and consuming previously non-preferred stimuli during post-treatment PSPAs that they never or rarely selected and consumed during pre-treatment PSPAs. These results were replicated both within participants (across different foods) and across participants. In fact, for some participants, during post-treatment PSPAs, some previously non-preferred stimuli displaced stimuli that were previously more preferred during the pre-treatment PSPA. It is possible these stimuli became more preferred or at least less aversive due to either continued exposure or pairing of high-preferred stimuli with their acceptance.

We also demonstrated it was possible to fade the schedule of reinforcement to an FR 3 for five of the eight participants, which suggests the durability and generality of the treatment effects. However, we were unable to fade the schedule of reinforcement effectively for all foods for three participants (Andre, Annie, and Gaston). Thus, the reinforcers delivered were not valuable enough to compete with access to 30 s of escape for refusal or problem behavior as the effort for acceptance was increased (e.g., DeLeon, Neidert, et al., 2001; Cooper et al., 1999). It is possible had we implemented additional interventions with some participants, we may have been able to more successfully fade the schedule. For example, it is possible that SEQ (combo – 2 min) or SEQ (combo) + EXT would have resulted in more effective fading of the reinforcement schedule for some participants for which fading was not effective under SEQ (combo).

Finally, results of the Food Selectivity Questionnaire offer insight into the extent to which caregivers perceived changes in his or her child's feeding behaviors, their satisfaction with

the changes, and whether they would like to implement the procedures at home or recommend the procedures to another parent. Results of the Food Selectivity Questionnaire revealed four of the seven caregivers agreed or strongly agreed that their child was more likely to eat previously disliked foods. Five of the seven caregivers agreed or strongly agreed their child was more likely to eat or try new foods. Three of the seven caregivers agreed or strongly agreed their child engaged in an associated decrease in problem behavior during meals. Additionally, one caregiver reported a 3.5 for this statement in that she somewhat agreed or agreed her child engaged in an associated decrease in problem behavior during meals. Four of the seven caregivers agreed or strongly agreed their child engaged in an associated decrease in whining and crying during meals. Five of the seven caregivers reported they were more comfortable taking their child to restaurants and social events. Four of the seven caregivers agreed or strongly agreed mealtimes had become more enjoyable. Six of the seven caregivers agreed or strongly agreed they were satisfied in the changes they had seen in their child's eating behavior. Three of the seven caregivers agreed or strongly agreed they had noticed changes in their child's eating behavior at home during treatment. Six of the seven caregivers agreed or strongly agreed they would like to implement these procedures during mealtimes at home. Finally, all caregivers agreed or strongly agreed they would recommend this treatment to other parents.

Although mean scores on the Food Selectivity Questionnaire indicate that caregivers somewhat agree to agree on the majority of statements, almost half of the caregivers agreed or strongly agreed with these statements. It is possible that the mean scores were lowered because one of the seven caregivers indicated disagree on the majority of questions. However, lower scores may be expected because we did not explicitly program for generalization, so it may be unlikely that caregivers observed the same changes in behavior at home that we observed during

the study. Additionally, it is interesting that three of the seven caregivers agreed or strongly agreed they noticed changes in their child's eating behavior at home; however, four agreed or strongly agreed their child was more likely to eat previously disliked foods, five agreed or strongly agreed their child was more likely to eat or try new foods, and six agreed or strongly agreed they were satisfied with the changes they've seen in their child's eating behavior. Although caregivers had the opportunity to complete open-ended statements about positive or negative outcomes, few caregivers did so. If more caregivers had responded to the open-ended statements, it may have helped to clarify how and why caregivers responded to certain closed-ended items, thus identifying potential rationales behind their responses on the closed-ended statements more accurately. For example, Andre's caregiver scored most statements as disagree or somewhat agree; however, she scored that she strongly agreed that she was satisfied in the changes she had seen in Andre's eating behavior. In reviewing her open-ended answers, she indicated, "Andre will now at least sit to observe what's offered to him at a mealtime." Additionally, she reported, "I love how much progress he has made, even if it was only a little." Perhaps, Andre's caregiver was responding that she was satisfied with behaviors that we did not directly assess in the closed-ended statements. It is possible other caregivers had responses similar to Andre's caregiver; however, it is unclear based on the portion of the questionnaires completed.

Although we did not program for generalization, results of the Food Selectivity Questionnaire, post-treatment PSPAs, and anecdotes from caregivers suggest that some generalization (i.e., reported agreement with increase in child's likelihood to eat previously disliked or novel foods) occurred for five participants (Anya, Gaston, George, Margot, and Valerie). Generalization may have occurred for several reasons. First, we did not control for the

therapist who conducted the sessions for each participant. Therefore, each participant had at least two therapists conducting sessions with him or her. It is possible that treatment with multiple therapists helped to promote generalization. Second, we targeted three non-preferred foods for each participant. For some participants, we targeted additional foods for subsequent treatment evaluations. It is possible that exposing the participants to multiple foods is similar to training sufficient exemplars (Stokes & Baer, 1977), which helped to promote generalization. Third, for some participants, our post-treatment PSPAs suggested increased preference for some of their previously non-preferred foods. Therefore, it is possible that this change in preference reduced the aversiveness of non-preferred foods such that in another context, outside of treatment sessions, the participants were more likely to consume these foods than they were in the past. Thus, it is possible that this preference carried over to other contexts such as mealtime at home. For example, Valerie's caregiver reported that she presented Valerie with a bowl of green beans at dinner one night. Valerie proceeded to eat the entire bowl of green beans and then said "Chips!" Although an anecdote, it suggests that her acceptance of previously non-preferred food, specifically green bean, transferred to the home environment.

For two participants (Andre and Harold), caregivers reported that generalization did not occur, which may limit the external validity of the current study. Although generalization was not reported to occur to the home setting for Andre and Harold, acceptance of non-preferred foods increased during post-treatment PSPAs. Specifically, both participants selected and consumed at least two of the previously non-preferred items during the post-treatment PSPA. It is possible that generalization did not occur to the home environment due to restricted stimulus control (Kirby & Bickel, 1988) in that acceptance only occurred under the specific training conditions of the current study. For example, Harold's caregiver asked why he would not eat

specific foods at home that we targeted during the treatment evaluation. Harold reported that he only eats those foods during research. This anecdote may suggest that certain stimuli control his acceptance of non-preferred food. Other variables that may affect generalization may include the setting, therapist, and other stimuli (e.g., foods, serving utensils). For example, it is possible that the way we prepared the foods restricted generalization. Although we targeted foods that were regularly prepared at home, we did not attempt to ensure that we prepared the food in an identical manner to which the caregiver serves the food at home. If we had prepared the food in the same manner, more caregivers may have reported generalization. Additionally, it is possible that programming the caregiver as therapist would also have resulted in a greater number of caregivers reporting generalization to the home. An important avenue for research is the evaluation of specific stimuli that are responsible for generalization effects to the home and school environment such that these stimuli can be programmed into treatment sessions to enhance the likelihood of generalization occurring. Additionally, an important avenue is also evaluating the procedures that are most effective for training caregivers to implement treatment for food selectivity with high treatment integrity. Increased generalization effects and training caregivers will likely lead to long-term maintenance of changes in feeding behavior across settings and time.

In addition to several limitations mentioned above, a limitation of the current study is the possibility of satiation effects. Although we attempted to control for reinforcer satiation by programming pre-session PSPAs, it is possible that some items became less preferred throughout the duration of the study. Depending on the participant's receptive abilities, researchers may attempt to ask the participant what he or she would like to earn or have a wider array of available choices prior to the start of session. It is possible that we would have obtained different effects

with some participants had we offered additional choices prior to sessions. Additionally, although we attempted to control for time between a meal and a session, it is possible that the requirement of 30 min was not a sufficient window to program for deprivation from food (Levin & Carr, 2001). That is, it is possible that participants were still full 30 min following meals, thus satiated on food. Although this is a possible limitation, we conducted most sessions prior to meals and based on the center's scheduling, naptime followed lunch for half of the participants, thus increasing the time between a large meal and sessions. An additional limitation is that the effects of the exposure trial with the moderately preferred food and statement of the session contingencies prior to the start of sessions is unclear. It is possible that these procedures increased the likelihood that participants contacted the contingency programmed for sessions. Thus, researchers should evaluate the effects of this pre-session procedure to determine whether it facilitates acceptance in the absence of escape EXT.

An additional avenue for research is to evaluate the specific characteristics of participants with whom it is and is not necessary to use escape EXT for increasing acceptance. It is possible that participants who engage in higher levels of acceptance with a wider array of foods prior to intervention may not necessarily need the addition of escape EXT to treat food selectivity; however, participants who have more restricted food intake may necessitate escape EXT to increase acceptance. Additionally, it would be interesting for researchers to evaluate the differences in problem behavior during times in which the aversive stimulus is present (i.e., bite presentation) and times when it is absent. Although we collected data on the specific topographies of problem behavior during each trial, we did not collect data on when the problem behavior occurred during the trial. When evaluating the side effects of escape EXT, it is important to determine when problem behavior is occurring to determine whether escape EXT

evokes EXT bursts, EXT-induced aggression, EXT-induced emotional responding, or extinction-induced response variability reported in other research (e.g., Azrin et al., 1966; Goh & Iwata, 1994; Lerman & Iwata, 1996; Zarcone et al., 1993).

Furthermore, researchers should continue to evaluate different parameters and combinations of reinforcement parameters for increasing acceptance of non-preferred foods in the absence of escape EXT. For example, it may be possible to decrease the quality of escape for refusal while increasing the quality of reinforcement for acceptance. Additionally, manipulations to delay of reinforcement may also be effective for increasing acceptance in the absence of extinction. For example, acceptance could result in immediate reinforcement, whereas refusal would result in a brief delay to reinforcement. If we can identify potent reinforcers or combinations of reinforcers that effectively compete with the escape contingency for refusal, it is possible that caregivers will not have to experience the challenges and risks associated with the use of escape EXT during mealtimes.

Overall, the results of this study suggest that it is possible to use different types of stimuli or combination of stimuli to increase acceptance of non-preferred foods in the absence of escape EXT. However, escape EXT was necessary for initial effects two participants. For both participants, following a history of escape EXT, it was possible to increase acceptance with a combination of stimuli contingent upon acceptance in the absence of escape EXT. Additionally, escape EXT was necessary to increase acceptance for two of the three foods for an additional participant. The results from this study may have important outcomes that are beneficial to caregivers and therapists of individuals with food selectivity. Escape EXT may not always be possible or safe to implement. Additionally, escape EXT may lead to undesirable side effects

such as EXT bursts and EXT-induced response variability (e.g., Lerman & Iwata, 1996). Thus, it is important to find alternative treatments that increase acceptance of non-preferred foods.

References

Ahearn, W. H., Kerwin, M. E., Eicher, P. S., Shantz, J., & Swearingin, W. (1996). An alternating treatments comparison of two intensive interventions for food refusal. *Journal of Applied Behavior Analysis, 29,* 321-332. doi: 10.1901/jaba.29-321

Allison, J., Wilder, D. A., Chong, I., Lugo, A., Pike, J., & Rudy, N. (2012). A comparison of differential reinforcement and noncontingent reinforcement to treat food selectivity in a child with autism. *Journal of Applied Behavior Analysis, 45,* 613-617. doi: 10.1901/jaba.2012.45-613

Anderson-Lopez, K., & Lopez, R. (2013). Let it go. On *Disney Frozen* [CD]. Burbank, CA: Wonderland Music Company.

Anderson, C. M., & McMillan, L. (2001). Parental use of escape extinction and differential reinforcement to treat food selectivity. *Journal of Applied Behavior Analysis, 34,* 511-515. doi: 10.1901/jaba.2001.34-511

Athens, E. S., & Vollmer, T. R. (2010). An investigation of differential reinforcement of alternative behavior without extinction. *Journal of Applied Behavior Analysis, 43,* 569-589. doi: 10.1901/jaba.2010.43-569

Azrin, N. H., Hutchinson, R. R., & Hake, D. F. (1966). Extinction-induced aggression. *Journal of the Experimental Analysis of Behavior, 9,* 191-204. doi: 10.1901/jeab.1965.8-55

Babbitt, R. L., Hoch, T. A., Coe, D. A. (1994). Behavioral feeding disorders. In D. Tuchman & R. Walters N. (Eds.), *Pediatric feeding and swallowing disorders: Pathology, diagnosis, and treatment*. San Diego, CA: Singular Publishing Group Incorporated.

Bachmeyer, M. H., Piazza, C. C., Fredrick, L. D., Reed, G. K., Rivas, K. D., & Kadey, H. J. (2009). Functional analysis and treatment of multiply controlled inappropriate mealtime behavior. *Journal of Applied Behavior Analysis, 42,* 641-658. doi: 10.1901/jaba.2009.42-641

Bandini, L. G., Anderson, S. E., Curtin, C., Cermak, S., Evans, E. W., Scampini, R.,… Must, A. (2010). Food selectivity in children with autism spectrum disorders and typically developing children. *The Journal of Pediatrics, 157,* 259-264. doi: 10.1016/j.jpeds.2010.02.013

Barahona, C, DuBard, M., Luiselli, J. K., & Kesterson, J. (2013). School-based feeding intervention to increase variety and quantity of foods consumed by an adolescent with autism. *Clinical Practice in Pediatric Psychology, 1,* 361-368. doi: 10.1037/cpp0000035

Baum, W. M. (1979). Matching, undermatching, and overmatching in studies of choice. *Journal of the Experimental Analysis of Behavior, 32,* 269-281. doi: 10.1901/jeab.1979.32-269

Borrero, C. S., Woods, J. N., Borrero, J. C., Masler, E. A., & Lesser, A. D. (2010). Descriptive analyses of pediatric food refusal and acceptance. *Journal of Applied Behavior Analysis, 43,* 71-88. doi: 10.1901/jaba.2010.43-71

Brown, J. F., Spencer, K., & Swift, S. (2002). A parent training programme for chronic food refusal: A case study. *British Journal of Learning Disabilities, 30,* 118-121. doi: 10.1046/j.1468-3156.2002.00128.x

Buckley, S. D., & Newchok, D. K. (2005). An evaluation of simultaneous presentation and differential reinforcement with response cost to reduce packing. *Journal of Applied Behavior Analysis, 38,* 405-409. doi: 10.1901/jaba.2005.38-405

Budd, K. S. (1998). Behavioral feeding assessment parent interview form. In J. H. Kedesdy, & K. S. Budd (Eds.), *Childhood feeding disorders: Biobehavioral assessment and*

intervention (pp. 93–97). Baltimore: Paul H. Brookes Publishing Co. (Original assessment published 1992).

Burklow, K. A., Phelps, A. N., Schultz, J. R., McConnell, K., & Rudolph, C. (1998). Classifying complex pediatric feeding disorders. *Journal of Pediatric Gastroenterology and Nutrition*, *27*, 143-147.

Carr, E. G., Newsom, C. D., & Binkoff, J. A. (1980). Escape as a factor in the aggressive behavior of two retarded children. *Journal of Applied Behavior Analysis, 13*, 101-117. doi: 10.1901/jaba.1980.13-101

Carter, S. L. (2010). A comparison of various forms of reinforcement with and without extinction as treatment for escape-maintained problem behavior. *Journal of Applied Behavior Analysis, 43*, 543-546. doi: 10.1901/jaba.2010.43-543

Cooper, L. J., Waker, D. P., Brown, K., McComas, J. J., Peck, S. M., Drew, J.,… Kayser, K. (1999). Use of a concurrent operants paradigm to evaluate positive reinforcers during treatment of food refusal. *Behavior Modification, 23,* 3-40. doi: 10.1177/0145445599231001

Cooper, L. J., Wacker, D. P., McComas, J. J., Brown, K., Peck, S. M., Richman, D,… Millard, T. (1995). Use of component analyses to identify active variables in treatment packages for children with feeding disorders. *Journal of Applied Behavior Analysis, 28*, 139-153. doi: 10.1901/jaba.1995.28-139

Cote, C. A., Thompson, R. H., Hanley, G. P., & McKerchar, P. M. (2007). Teacher report and direct assessment of preferences for identifying reinforcers for young children. *Journal of Applied Behavior Analysis, 40,* 157-166. doi: 10.1901/jaba.2007.177-05

Cowdery, G. E., Iwata, B. A., & Pace, G. M. (1990). Effects and side effects of DRO as treatment for self-injurious behavior. *Journal of Applied Behavior Analysis, 23*, 497-506. doi: 10.1901/jaba.1990.23-497

DeLeon, I. G., Fisher, W. W., Rodriguez-Catter, V., Maglieri, K., Herman, K., & Marhefka, J. M. (2001). Examination of relative reinforcement effects of stimuli identified through pretreatment and daily brief preference assessments. *Journal of Applied Behavior Analysis, 34*, 463-473. doi: 10.1901/jaba.2001.34-463

DeLeon, I. G., Neidert, P. L., Anders, B. M., & Rodriguez-Catter, V. (2001). Choices between positive and negative reinforcement during treatment for escape-maintained behavior. *Journal of Applied Behavior Analysis, 34*, 521-525. doi: 10.1901/jaba.2001.34-521

Field, D., Garland, M., & Williams, K. (2003). Correlates of specific childhood feeding problems. *Journal of Paediatrics Child Health, 39*, 299-304. doi: 10.1046/j.1440-1754.2003.00151.x

Fisher, W. W., Piazza, C. C., Bowman, L. G., Hagopian, L. P., Owens, J. C., & Slevin, I. (1992). A comparison of two approaches for identifying reinforcers for persons with severe and profound disabilities. *Journal of Applied Behavior Analysis, 25*, 491-498. doi: 10.1901/jaba.1992.25-491

Freeman, K. A., & Piazza, C. C. (1998). Combining stimulus fading, reinforcement, and extinction to treat food refusal. *Journal of Applied Behavior Analysis, 31*, 691-694. doi: 10.1901/jaba.1998.31-691

Fu, S. B., Penrod, B., Fernand, J. K., Whelan, C. M., Griffith, K., & Medved, S. (2015). The effects of modeling contingencies in the treatment of food selectivity in children with autism. *Behavior Modification, 39*, 771-784. doi: 10.1177/0145445515592639

Gentry, J. A., & Luiselli, J. K. (2008). Treating a child's selective eating through parent implemented feeding intervention in the home setting. *Journal of Developmental and Physical Disabilities, 20,* 63-70. doi: 10.1007/s10882-007-9080-6

Goh, H. L., & Iwata, B. A. (1994). Behavioral persistence and variability during extinction of self-injury maintained by escape. *Journal of Applied Behavior Analysis*, *27*, 173-174. doi: 10.1901/jaba.1994.27-173

Greer, A. J., Gulotta, C. S., Masler, E. A., & Laud, R. B. (2008). Caregiver stress and outcomes of children with pediatric feeding disorders treated in an intensive interdisciplinary program. *Journal of Pediatric Psychology*, *33*, 612-620. doi: 10.1093/jpepsy/jsm116

Gulotta, C. S., Piazza, C. C., Patel, M. R., & Layer, S. A. (2005). Using food redistribution to reduce packing in children with severe food refusal. *Journal of Applied Behavior Analysis*, *38*, 39-50. doi: 10.1901/jaba.2005.168-03

Hernstein, R. J. (1961). Relative and absolute strength of response as a function of frequency of reinforcement. *Journal of Experimental Analysis of Behavior*, *4*, 267-272. doi: 10.1901/jeab.1961.4-267

Hoch, H., McComas, J. J., Thompson, A. L., & Paone, D. (2002). Concurrent reinforcement schedules: Behavior change and maintenance without extinction. *Journal of Applied Behavior Analysis*, *35*, 155-169. doi: 10.1901/jaba.2002.35-155

Ingvarsson, E. T., Kahng, S., & Hausman, N. L. (2008). Some effects of noncontingent positive reinforcement on multiply controlled problem behavior and compliance in a demand context. *Journal of Applied Behavior Analysis, 41,* 435-440. doi: 10.1901/jaba.2008.41-435

Ives, C. C., Harris, S. L., & Wolchik, S. A. (1978). Food refusal in an autistic type child treated by a multi-component forced feeding procedure. *Journal of Behavior Therapy and Experimental Psychiatry*, *9*, 61-64. doi: 10.1016/0005-7916(78)90090-3

Iwata, B. A., Pace, G. M., Kalsher, M. J., Cowdery, G. E., & Cataldo, M. F. (1990). Experimental analysis and extinction of self-injurious escape behavior. *Journal of Applied Behavior Analysis*, *23*, 11-27. doi: 10.1901/jaba.1990.23-11

Johnson, C. R., Turner, K., Stewart, P. A., Schmidt, B., Shui, A., Macklin, E,… Hyman, S. L. (2014). Relationships between feeding problems, behavioral characteristics and nutritional quality in children with ASD. *Journal of Autism and Developmental Disorders*, *44*, 2175-2184. doi: 10.1007/s10803-014-2095-9

Jones, B. A., Dozier, C. L., & Neidert, P. L. (2014). An evaluation of the effects of access duration on preference assessment outcomes. *Journal of Applied Behavior Analysis*, *47*, 209-213. doi: 10.1002/jaba.100

Kedesdy, J. H., & Budd, K. S. (1998). *Childhood feeding disorders: Biobehavioral assessment and intervention*. Baltimore: Paul H. Brooks Publishing Co., Inc.

Kelly, M. A., Roscoe, E. M., Hanley, G. P., & Schlichenmeyer, K. (2014). Evaluation of assessment methods for identifying social reinforcers. *Journal of Applied Behavior Analysis*, *47*, 113-135. doi: 10.1002/jaba.107

Kern, L., & Marder, T. J. (1996). A comparison of simultaneous and delayed reinforcement as treatments for food selectivity. *Journal of Applied Behavior Analysis, 29*, 243-246. doi: 10.1901/jaba.1996.29-243

Kirby, K. C., & Bickel, W. K. (1988). Toward an explicit analysis of generalization: A stimulus control interpretation. *The Behavior Analyst*, *11*, 115-129. doi: 10.1007/bf03392465

Knox, M., Rue, H. C., Wildenger, L., Lamb, K., & Luiselli, J. K. (2012). Intervention for food selectivity in a specialized school setting: Teacher implemented prompting, reinforcement, and demand fading for an adolescent student with autism. *Education and Treatment of Children*, *35*, 407-417. doi: 10.1353/etc.2012.0016

Kodak, T., & Piazza, C. C. (2008). Assessment and behavioral treatment of feeding and sleeping disorders in children with autism spectrum disorders. *Child and Adolescent Psychiatric Clinics of North America*, *17*, 887-905. doi: 10.1016/j.chc.2008.06.005

Koegel, R. L., Bharoocha, A. A., Ribnick, C. B., Ribnick, R. C., Bucio, M. O., Fredeen, R. M., & Koegel, L. K. (2012). Using individualized reinforcers and hierarchical exposure to increase food flexibility in children with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *42*, 1574-1581. doi: 10.1007/s10803-011-1392-9

Lalli, J. S., & Casey, S. D. (1996). Treatment of multiply controlled problem behavior. *Journal of Applied Behavior Analysis*, *29*, 391-395. doi: 10.1901/jaba.1996.29-391

Lalli, J. S., Vollmer, T. R., Progar, P. R., Wright, C., Borrero, J., Daniel, D.,… May, W. (1999). Competition between positive and negative reinforcement in the treatment of escape behavior. *Journal of Applied Behavior Analysis*, *32*, 285-296. doi: 10.1901/jaba.1999.32-285

LaRue, R. H., Stewart, V., Piazza, C. C., Volkert, V. M., Patel, M. R., & Zeleny, J. (2011). Escape as reinforcement and escape extinction in the treatment of feeding problems. *Journal of Applied Behavior Analysis*, *44*, 719-735. doi: 10.1901/jaba.2011.44-719

Ledford, J. R., & Gast, D. L. (2006). Feeding problems in children with autism spectrum disorders: A review. *Focus on Autism and Other Developmental Disabilities*, *21*, 153-166. doi: 10.1177/10883576060210030401

Lerman, D. C., & Iwata, B. A. (1996). Prevalence of the extinction burst and its attenuation during treatment. *Journal of Applied Behavior Analysis, 28,* 93-94. doi: 10.1901/jaba.1995.28-93

Levin, L., & Carr, E. G. (2001). Food selectivity and problem behavior in children with developmental disabilities. *Behavior Modification, 25*, 443-470. doi: 10.1177/0145445501253004

Lewinshon, P. M., Holm-Denoma, J. M., Gau, J. M., Joiner, T. E., Striegel-Moore, R., Bear, P., & Lamoureux, B. (2005). Problematic eating and feeding behaviors of 36-month-old children. *International Journal of Eating Disorders, 38,* 208-219. doi: 10.1002/eat.20175

Linscheid, T. R. (2006). Behavioral treatments for pediatric feeding disorders. *Behavior Modification, 30*, 6-23. doi: 10.1177/01455445505282165

Lomas, J. E., Fisher, W. W., & Kelley, M. E. (2010). The effects of variable-time delivery of food items and praise on problem behavior reinforced by escape. *Journal of Applied Behavior Analysis, 23,* 425-435. doi: 10.1901/jaba.2010.43-425

Luiselli, J. K. (2006). Pediatric feeding disorders. In J. K. Luiselli (Ed.), *Antecedent assessment and intervention: Supporting children and adults with developmental disabilities in community setting* (pp. 165-185). Baltimore, MS: Paul H. Brookes Publishing.

Manikam, R., & Perman, J. (2000). Pediatric feeding disorders. *Journal of Clinical Gastroenterology, 30*, 34-46. doi: 10.1097/00004836-200001000-00007

Marquenie, K., Rodger, S., Mangohig, K., & Cronin, A. (2011). Dinnertime and bedtime routines and rituals in families with a young child with an autism spectrum disorder. *Australian Occupational Therapy Journal, 58,* 145–154. doi: 10.1111/j.1440-1630.2010.00896.x

McConnachie, G., & Carr, E. G. (1997). The effects of child behavior problems on the maintenance of intervention fidelity. *Behavior Modification, 21*, 123-158. doi: 10.1177/01454455970212001

McDowell, C., Duffy, K., & Kerr, K. P. (2007). Increasing food acceptance and reducing challenging behaviour in a four-year-old girl with autism. *European Journal of Behavior Analysis, 8,* 267-276.

McIlvane, W. J., & Dube, W. V. (1992). On terms: Stimulus control shaping and stimulus control topographies. *The Behavior Analyst*, *15*, 89-94.

Michael, J. (1982). Distinguishing between discriminative and motivational functions of stimuli. *Journal of the Experimental Analysis of Behavior*, *37,* 149-155. doi: 10.1901/jeab.1982.37-149

Munk, D. D., & Repp, A. C. (1994). Behavioral assessment of feeding problems of individuals with severe disabilities. *Journal of Applied Behavior Analysis*, *27,* 241-250. doi: 10.1901/jaba.1994.27-241

Murphy, J., & Zlomke, K. R. (2016). A behavioral parent-training intervention for a child with avoidant/restrictive food intake disorder. *Clinical Practice in Pediatric Psychology*, *4*, 23-34. doi: 10.1037/cpp0000128

Najdowski, A. C., Wallace, M. D., Doney, J. K., & Ghezzi, P. M. (2003). Parental assessment and treatment of food selectivity in natural settings. *Journal of Applied Behavior Analysis*, *36,* 383-386. doi: 10.1901/jaba.2003.36-383

Najdowski, A. C., Wallace, M. D., Penrod, B., Tarbox, J., Reagon, K., & Higbee, T. S. (2008). Caregiver-conducted experimental functional analyses of inappropriate mealtime

behavior. *Journal of Applied Behavior Analysis, 41,* 459-465. doi: 10.1901/jaba.2008.41-459

Najdowski, A. C., Wallace, M. D., Reagon, K., Penrod, B., Higbee, T. S., & Tarbox, J. (2010). Utilizing a home-based parent training approach in the treatment of food selectivity. *Behavioral Interventions, 25,* 89-107. doi: 10.1002/bin.298

Nevin, J. A., & Wacker, D. P. (2013). Response strength and persistence. In G. J. Madden (Ed.), *Handbook of behavior analysis: Volume 2*. Washington, D.C.: American Psychological Association.

Pace, G. M., Ivancic, M. T., Edwards, G. L., Iwata, B. A., & Page, T. J. (1985). Assessment of stimulus preference and reinforcer value with profoundly retarded individuals. *Journal of Applied Behavior Analysis, 18,* 249-255. doi: 10.1901/jaba.1985.18-249

Palmer, S., & Horn, S. (1978). Feeding problems in children. In S. Palmer & S. Ekvall (Eds.), *Pediatric nutrition in developmental disorders* (pp. 107-129). Springfield, IL: Thomas.

Patel, M. R. (2013). Assessment of pediatric feeding disorders. In D. D. Reed, F. D. DiGennaro Reed, & J. K. Luiselli (Eds.), *Handbook of crisis intervention and developmental disabilities,* Issues in clinical child psychology (pp. 169-182). New York: Springer.

Payne, S. W., & Dozier, C. L. (2013). Positive reinforcement as treatment for problem behavior maintained by negative reinforcement. *Journal of Applied Behavior Analysis, 46,* 699-703. doi: 10.1002/jaba.54

Penrod, B., Gardella, L., & Fernand, J. (2012). An evaluation of a progressive high-probability instructional sequence combined with low-probability demand fading in the treatment of food selectivity. *Journal of Applied Behavior Analysis, 45,* 527-537. doi: 10.1901/jaba.2012.45-527

Penrod, B., Wallace, M. D., Reagon, K., Betz, A., & Higbee, T. S. (2010). A component analysis of a parent-conducted multi-component treatment for food selectivity. *Behavioral Interventions, 25*, 207-228. doi: 10.1002/bin.307

Piazza, C. C. (2008). Feeding disorders and behavior: What have we learned? *Developmental Disabilities Research Reviews, 14*, 174-181. doi: 10.1002/ddrr.22

Piazza, C. C., Fisher, W. W., Brown, K. A., Shore, B. A., Patel, M. R., Katz, R. M.,… Blakely-Smith, A. (2003). Functional analysis of inappropriate mealtime behaviors. *Journal of Applied Behavior Analysis, 36*, 187-204. doi: 10.1901/jaba.2003.36-187

Piazza, C. C., Fisher, W. W., Hanley, G. P., Remick, M. L., Contrucci, S. A., & Aitken, T. L. (1997). The use of positive and negative reinforcement in the treatment of escape-maintained destructive behavior. *Journal of Applied Behavior Analysis, 30*, 279-298. doi: 10.1901/jaba.1997.30-279

Piazza, C. C., Milnes, S. M., & Shalev, R. A. (2015). A behavior-analytic approach to the assessment and treatment of pediatric feeding disorders. In H. S. Roane, J. E. Ringdahl, & T. S. Falcomata (Eds.) *Clinical and organizational applications of applied behavior analysis* (pp. 69-94). San Diego, CA: Elsevier Publishing.

Piazza, C. C., Patel, M. R., Santana, C. M., Goh, H. L., Delia, M. D., & Lancaster, B. M. (2002). An evaluation of simultaneous and sequential presentation of preferred and non-preferred food to treat food selectivity. *Journal of Applied Behavior Analysis, 35*, 259-270. doi: 10.1901/jaba.2002.35-259

Pizzo, B., Coyle, M., Seiverling, L., & Williams, K. (2012). Plate A-plate B: Use of sequential presentation in the treatment of food selectivity. *Behavioral Interventions, 27*, 175-184. doi: 10.1002/bin.1347

Riordan, M. M., Iwata, B. A., Finney, J. W., Wohl, M. K., & Stanley, A. E. (1984). Behavioral assessment and treatment of chronic food refusal in handicapped children. *Journal of Applied Behavior Analysis, 17,* 327-341. doi: 10.1901/jaba.1984.17-327

Riordan, M. M., Iwata, B. A., Wohl, M. K., & Finney, J. W. (1980). Behavioral treatment of food refusal and selectivity in developmentally disabled children. *Applied Research in Mental Retardation, 1,* 95-112. doi: 10.1016/0270-3092(80)90019-3

Sevin, B. M., Gulotta, C. S., Sierp, B. J., Rosica, L. A., & Miller, L. J. (2002). Analysis of response covariation among multiple topographies of food refusal. *Journal of Applied Behavior Analysis, 35,* 65-68. doi: 10.1901/jaba.2002.35-65

Sharp, W. G., Jaquess, D. L., Bogard, J. D., & Morton, J. F. (2010). Additive, multi-component treatment of emerging refusal topographies in a pediatric feeding disorder. *Child & Family Behavior Therapy, 32,* 51-69. doi: 10.1080/07317100903539931

Shore, B. A., Babbitt, R. L., Williams, K. E., Coe, D. A., & Snyder, A. (1998). Use of texture fading in the treatment of food selectivity. *Journal of Applied Behavior Analysis, 31,* 621-633. doi: 10.1901/jaba.1998.31-621

Sidman, M., & Stoddard, L. T. (1967). The effectiveness of fading in programming a simultaneous form discrimination for retarded children. *Journal of the Experimental Analysis of Behavior, 10,* 3-15. doi: 10.1901/jeab.1967.10-3

Silbaugh, B. C., Penrod, B., Whelan, C. M., Hernandez, D. A., Wingate, H. V., Falcomata, T. S., & Lang, R. (2016). A systematic synthesis of behavioral interventions for food selectivity of children with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 3,* 345-357. doi: 10.1007/s40489-016-0087-8

Stokes, T. F., & Baer, D. M. (1977). An implicit technology of generalization. *Journal of Applied Behavior Analysis, 10,* 349-367. doi: 10.1901/jaba.1977.10-349

Sundberg M. L. VB-MAPP (2008): *Verbal behavior milestones assessment and placement program*. Concord, CA: AVB Press

Todd, J. T., Morris, E. K., & Fenza, K. M. (1989). Temporal organization of extinction-induced responding in preschool children. *The Psychological Record, 39,* 117-130.

Twachtman-Reilly, J., Amaral, S. C., & Zebrowski, P. P. (2008). Addressing feeding disorders in children on the autism spectrum in school-based settings: Physiological and behavioral issues. *Language, Speech, and Hearing Services in Schools*, *39,* 261-272. doi: 10.1044/0161-1461(2008/025)

US Department of Health and Human Services, & US Department of Agriculture (2015). *2015-2020 dietary guidelines of Americans* (8th ed.). Retrieved from http://health.gov/dietaryguidelines/2015/guidelines/

Valdimarsdóttir, H., Halldórsdóttir, L. Y., & Sigurðardóttir, Z. G. (2010). Increasing the variety of foods consumed by a picky eater: Generalization of effects across caregivers and settings. *Journal of Applied Behavior Analysis*, *43,* 101-105. doi: 10.1901/jaba.2010.43-101

VanDalen, K. H., & Penrod, B. (2010). A comparison of simultaneous versus sequential presentation of novel foods in the treatment of food selectivity. *Behavioral Interventions*, *25*, 191-206. doi: 10.1002/bin.310

Wilkins, J. W., Piazza, C. C., Groff, R. A., Volkert, V. M., Kozisek, J. M., & Milnes, S. M. (2014). Utensil manipulation during initial treatment of pediatric feeding problems. *Journal of Applied Behavior Analysis*, *47,* 694-709. doi: 10.1002/jaba.169

Williams, K. E., & Seiverling, L. (2010). Eating problems in children with autism spectrum disorders. *Topics in Clinical Nutrition, 25*, 27-37. doi: 10.1097/tin.0b013e3181d10958

Zarcone, J. R., Iwata, B. A., Hughes, C. E., & Vollmer, T. R. (1993). Momentum versus extinction effects in the treatment of self-injurious escape behavior. *Journal of Applied Behavior Analysis, 26*, 135-136. doi: 10.1901/jaba.1993.26-135

Zimmer, M. H., Hart, L. C., Manning-Courtney, P., Murray, D. S., Bing, N. M., & Summer, S. (2012). Food variety as a predictor of nutritional status among children with autism. *Journal of Autism and Developmental Disorders, 42*, 549-556. doi: 10.1007/s10803-011-1268-z

Table 1

Participant demographics

Participant	Age	Diagnosis	Receptive Language	Food Accepted	Food Refused	Problem Behavior
Andre	4	ASD	Prompt Dependent (model or physical prompt)	Grains	Vegetables, proteins, fruits	Eat too slowly, play w/ food, spit food, refuse to open mouth
Annie	6	ASD	2-step instructions	Grains, fruits	Vegetables, proteins	Gag, turn away, cry or tantrum
Anya	5	Global Developmental Delays	2-step instructions	Grains, dairy, proteins	Vegetables, fruits	Turn away, throw or drop food, eat too little, push food, cry or tantrum
Gaston	2	No known diagnosis	3-step instructions	Grains, fruits, dairy	Vegetables, proteins	Spit food, push food, refuse to open mouth
George	5	No known diagnosis	2-step instructions	Grains, dairy, proteins	Vegetables, fruits	Leave table, eat too little
Harold	4	ASD	> 3-step instructions	Limited grains, vegetables, fruits, proteins	Grains, vegetables, fruits, dairy, proteins	Leave table, push food
Margot	2	ASD	1-step instructions (model or physical prompt)	Grains, proteins, dairy	Vegetables, fruits	Leave table, push food, refuse to open mouth, and cry or tantrum
Valerie	5	Down syndrome and ASD	2-step instructions	Proteins, grains	Vegetables, fruits	Eat too slow or too little, vomit or gag, spit food, turn away, leave table, push food, cry or tantrum

Table 2

Summary of high-preference stimuli identified in the preference stimuli preference assessments

Participant	HP Food	MP Food	HP Toys	HP Attention
Andre	Starbursts® Cheddar Rice Cake, Doritos® Nacho Cheese	Welch's® Fruit Snacks	Pins and Needles, Light Up Fan	N/A
Annie	Cheddar Popcorn, Cheddar Rice Cakes, Goldfish® Pretzel, Blueberry, Apple, Pineapple	Tortilla Chips	Sensory Bottles, Light Up Wand	Cuddles, Funny Faces
Anya	Ritz Crackers, Cheetos®, Animal Crackers	Tortilla Chips	Piano, Music Box	Singing, Jumping
Gaston	Welch's® Fruit Snacks, Vanilla Bunny Grahams, Veggie Straws®, Apple, Grape, Cantaloupe	Chocolate Bunny Grahams	Bubble Gun, Furry Ball	Conversation, Praise
George	Chocolate Bunny Grahams, Chips, Honey Bunches of Oats®	Rice Cake	Pins and Needles, Bubble Gun	Chase
Harold	Deli Turkey, Rice Cakes, Breaded Chicken	Goldfish® Pretzel	Music Box, Bubble Gun	Silly Conversation, Tickles
Margot	Ritz Cheese Crackers, Oreos®, Little Debbie™ Honey Bun	Pita Pockets, Ritz Cheese Crackers	"Let It Go" on iPod touch®	Foot rubs
Valerie	Potato Chip, Cheerios™, Popcorn	Ritz Crackers, Goldfish® Pretzel	Light Up Wand, Maracas	Cheers, Tickles

Table 3

Summary of procedural safeguards

Participant	Procedural Safeguards
Andre	Padded session room
Annie	Padded session room
Anya	N/A
Gaston	Second therapist for first EXT session
George	N/A
Harold	N/A
Margot	Second therapist for first EXT session
Valerie	Second therapist for first EXT session

Table 4

Results of the Food Selectivity Questionnaire

			Number of Respondents				
Statement	N	Mean	Strongly disagree	Disagree	Somewhat agree	Agree	Strongly agree
My child is more likely to eat previously disliked foods.	7	3.6		2	1	2	2
My child is more likely to eat or try new foods.	7	3.7		2	0	3	2
There has been an associated decrease in problem behavior during meals.	7	3.4		1	2.5	3.5	0
There has been an associated decrease in whining and crying during meals.	7	3.6		1	2	3	1
I feel more comfortable taking my child to restaurants and social events.	7	4		1	1	2	3
Mealtimes have become more enjoyable.	7	3.7		1	2	2	2
I am satisfied with the changes I've seen in my child's eating behavior.	7	4.1		1		3	3
I noticed changes in my child's eating behavior at home during treatment.	7	3.6		1	3	1	2
I would like to implement these procedures during mealtimes at home.	7	4.4			1	2	4
I would recommend this treatment to other parents.	7	4.9				1	6

Note. For statement three, one respondent scored between somewhat agree and agree, thus half of the caregiver's response was scored as somewhat agree and the other half scored as agree.

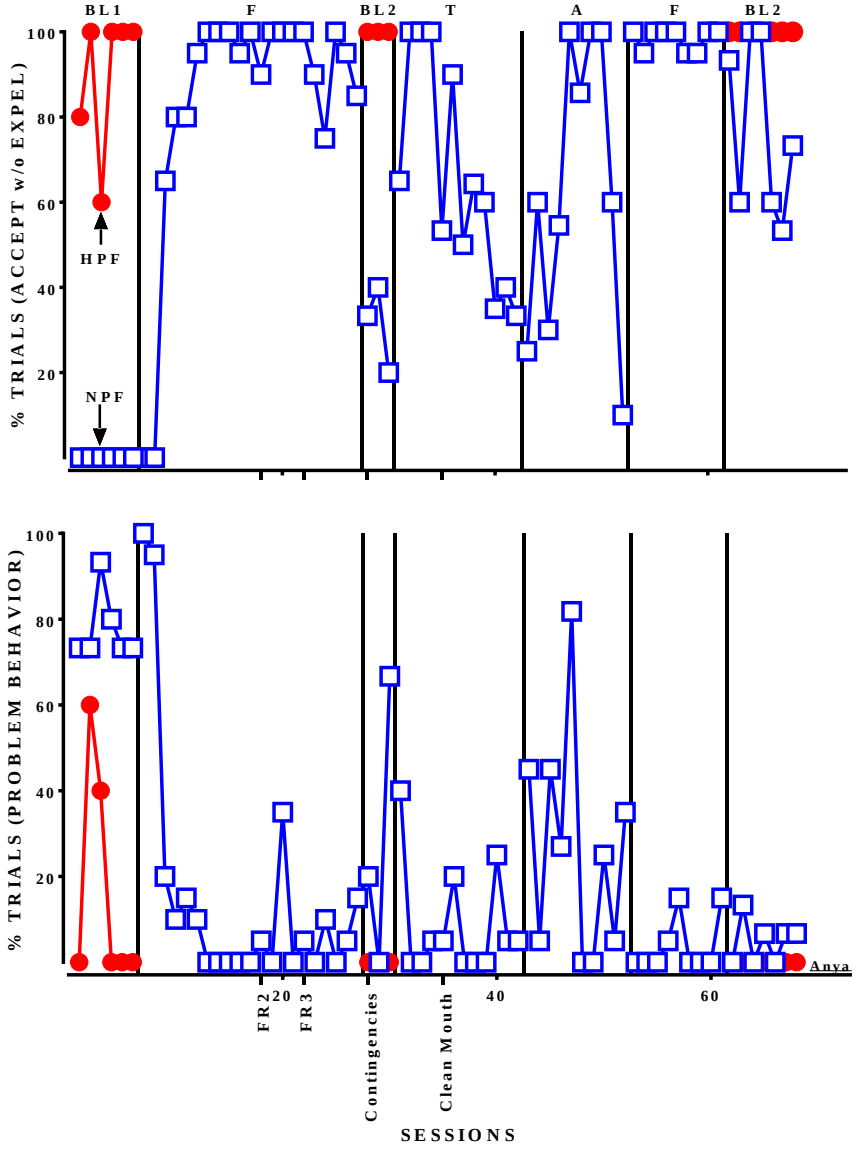


Figure 1. Anya's percentage of trials with acceptance without expulsion (top panel) and problem behavior (bottom panel). The closed red data path depicts trials with high-preferred food (HPF), and the open blue data path depicts trials with non-preferred foods (NPF). Baseline is denoted by BL, SEQ (F) by F, SEQ (T) by T, and SEQ (A) by A. The ticks on the bottom x-axis depict procedural changes including schedule of reinforcement changes (to fixed-ratio 2 [FR2] and fixed-ratio 3 [FR3] schedules), addition of exposure to contingencies prior to sessions, and addition of the clean-mouth procedure and contingencies.

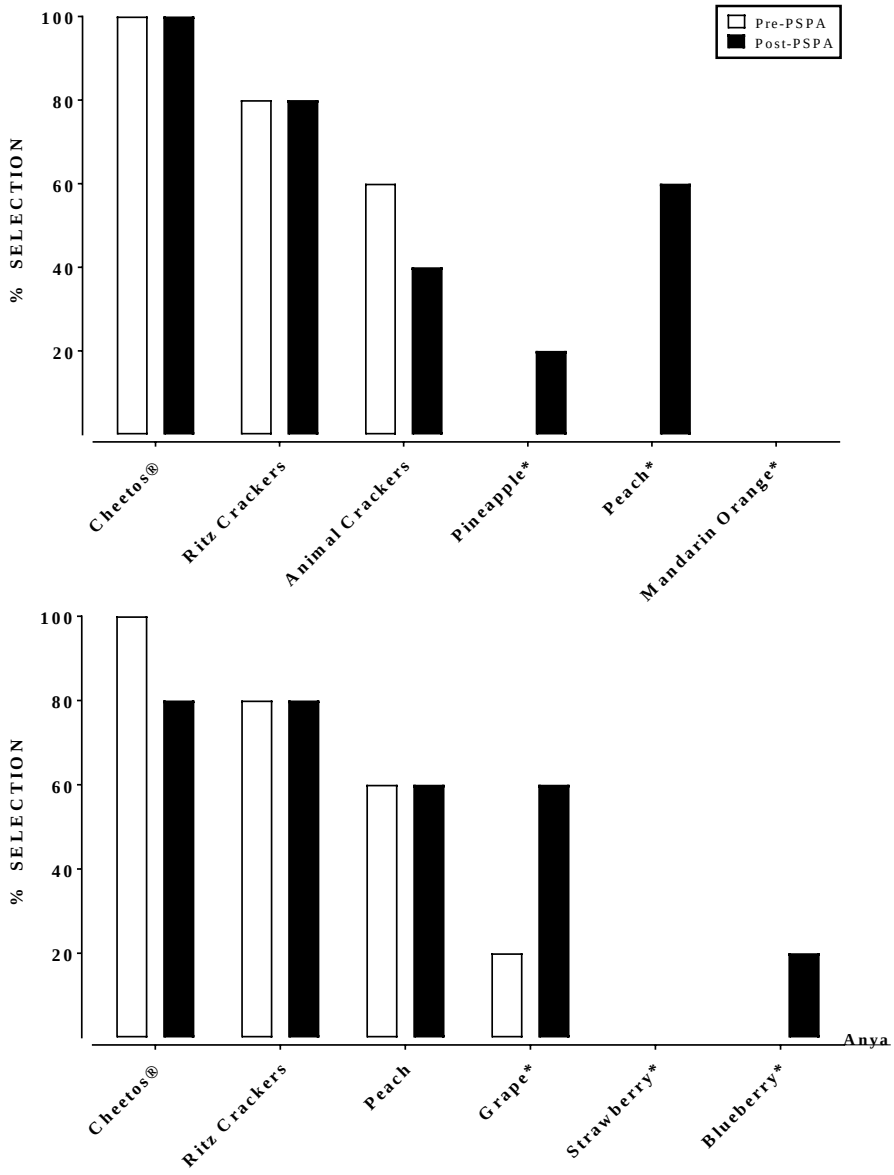


Figure 2. The percentage of trials Anya chose each of the food items during the pre-treatment PSPA (open bars) and post-treatment PSPA (closed bars) for the first (top panel) and second (bottom panel) treatment evaluation. The asterisks denote the non-preferred foods targeted for treatment.

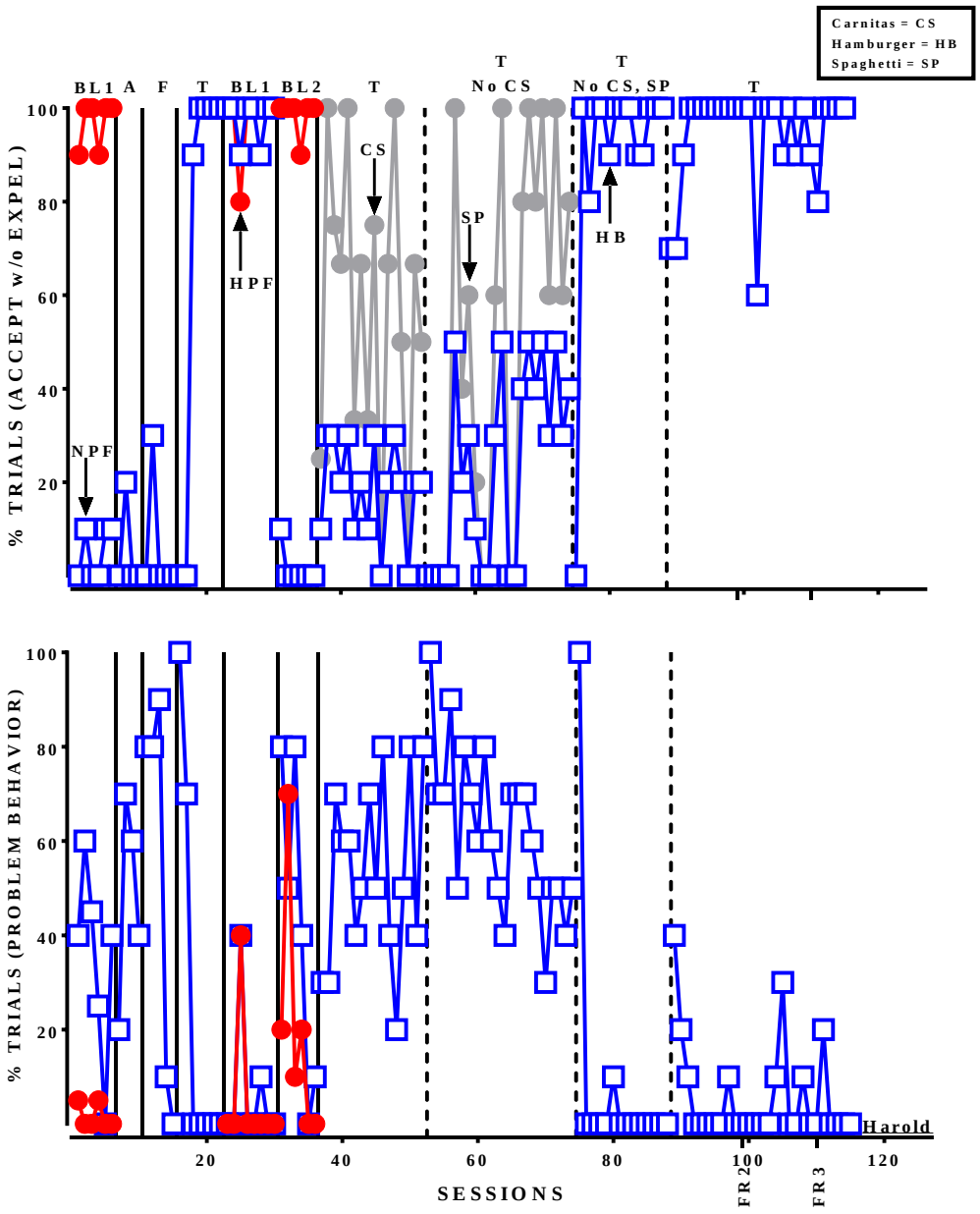


Figure 3. Harold's percentage of trials with acceptance without expulsion (top panel) and problem behavior (bottom panel). The closed red data path depicts trials with high-preferred food (HPF), the open blue data path depicts trials with non-preferred foods (NPF), and the closed gray data path depicts trials with one NPF food. Baseline is denoted by BL, SEQ (F) by F, SEQ (T) by T, and SEQ (A) by A. The ticks on the bottom x-axis depict schedule of reinforcement changes (to fixed-ratio 2 [FR2] and fixed-ratio 3 [FR3] schedules).

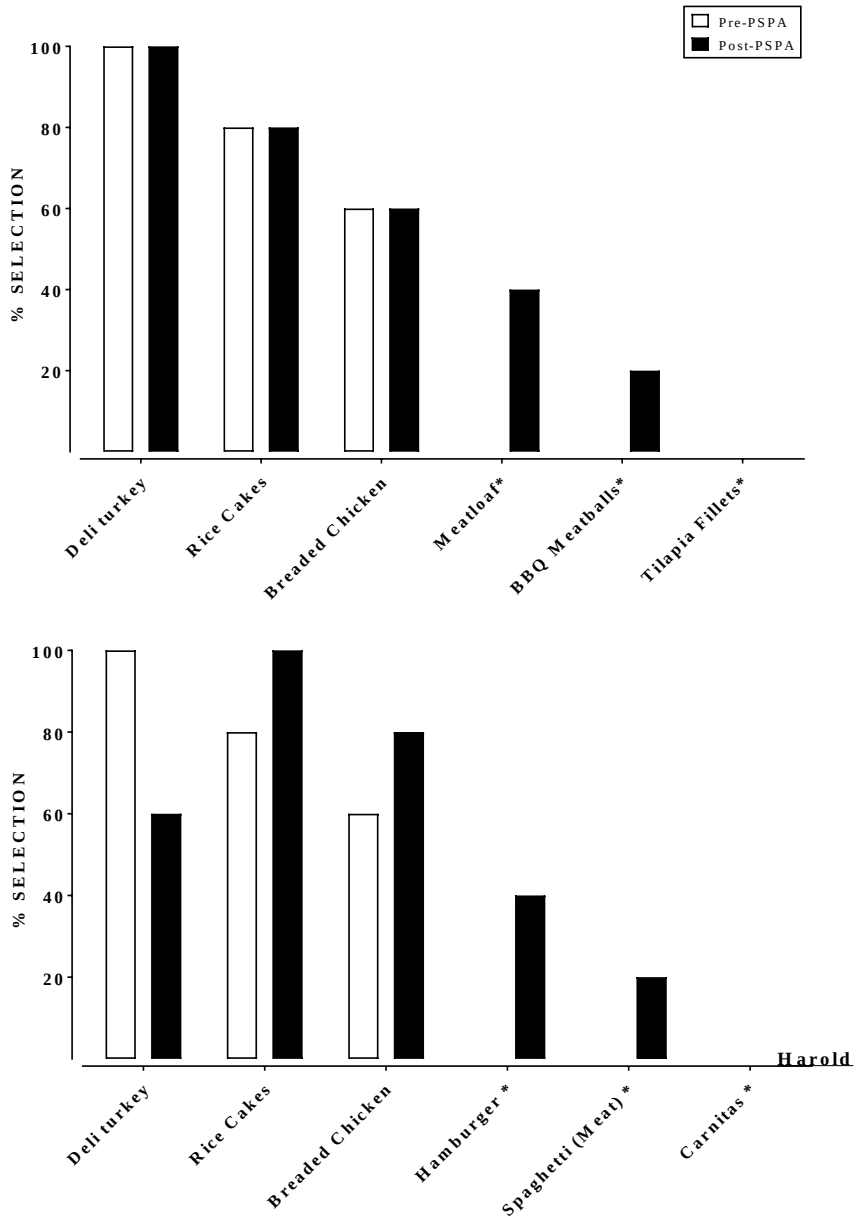


Figure 4. The percentage of trials Harold chose each of the food items during the pre-treatment PSPA (open bars) and post-treatment PSPA (closed bars) for the first (top panel) and second (bottom panel) treatment evaluation. The asterisks denote the non-preferred foods targeted for treatment.

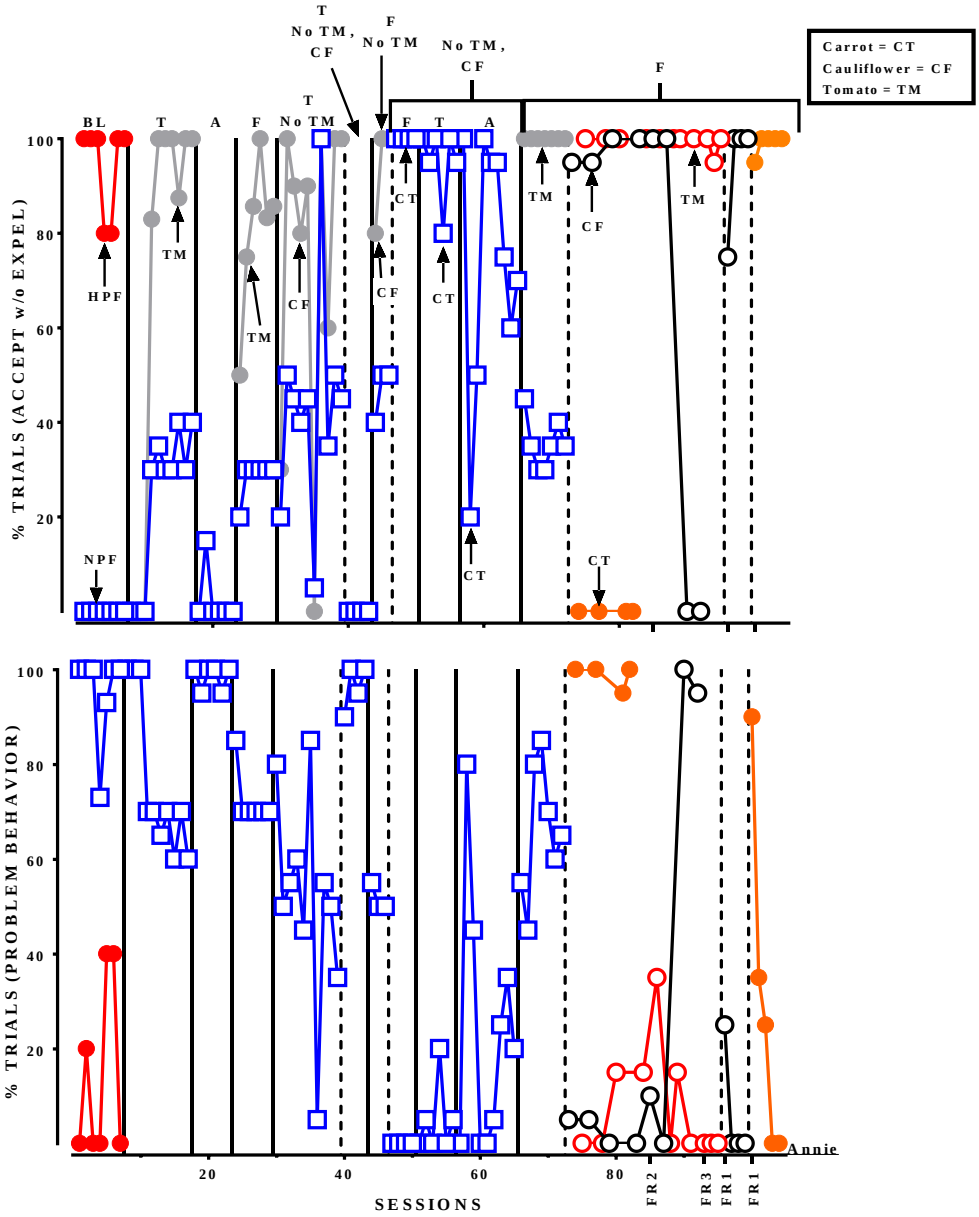


Figure 5. Annie's percentage of trials with acceptance without expulsion (top panel) and problem behavior (bottom panel). The closed red data path depicts trials with high-preferred food (HPF), the open blue data path depicts trials with non-preferred foods (NPF), and the closed gray data path depicts trials with one NPF food. Baseline is denoted by BL, SEQ (F) by F, SEQ (T) by T, and SEQ (A) by A. The ticks on the bottom x-axis depict schedule of reinforcement changes (to fixed-ratio 2 [FR2] and fixed-ratio 3 [FR3] schedules).

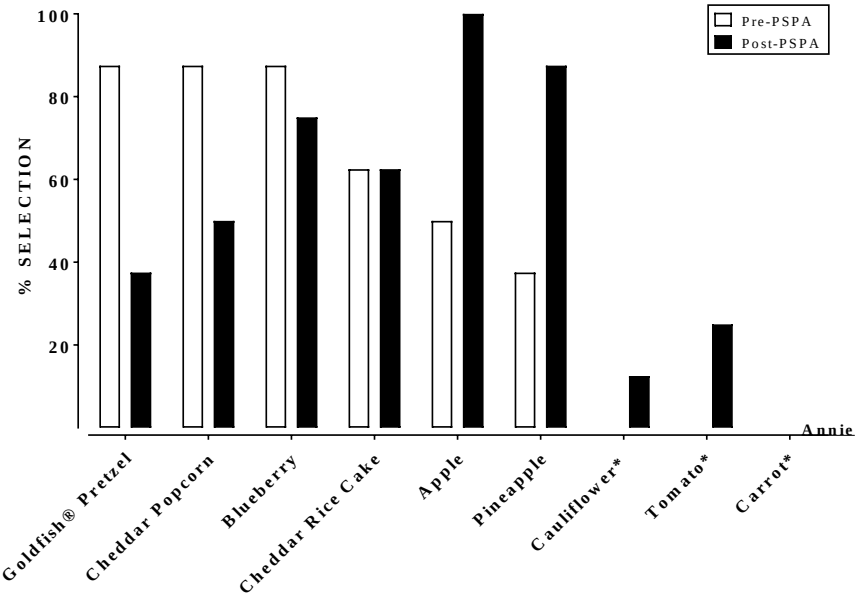


Figure 6. The percentage of trials Annie chose each of the food items during the pre-treatment PSPA (open bars) and post-treatment PSPA (closed bars) for the treatment evaluation. The asterisks denote the non-preferred foods targeted for treatment.

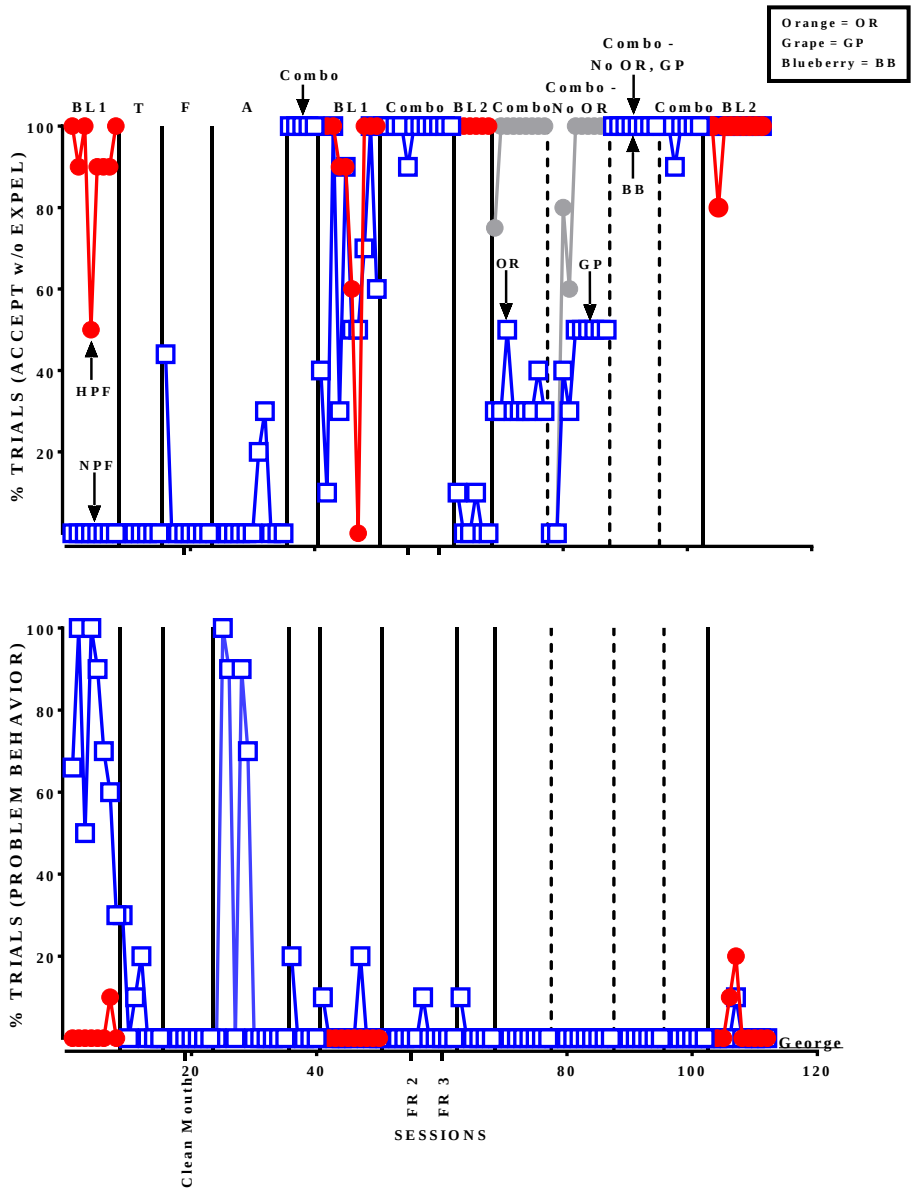


Figure 7. George's percentage of trials with acceptance without expulsion (top panel) and problem behavior (bottom panel). The closed red data path depicts trials with high-preferred food (HPF), the open blue data path depicts trials with non-preferred foods (NPF), and the closed gray data path depicts trials with one NPF food. Baseline is denoted by BL, SEQ (F) by F, SEQ (T) by T, SEQ (A) by A, and SEQ (combo) by Combo. The ticks on the bottom x-axis depict procedural changes including schedule of reinforcement changes (to fixed-ratio 2 [FR2] and fixed-ratio 3 [FR3] schedules) and addition of the clean-mouth procedure and contingencies.

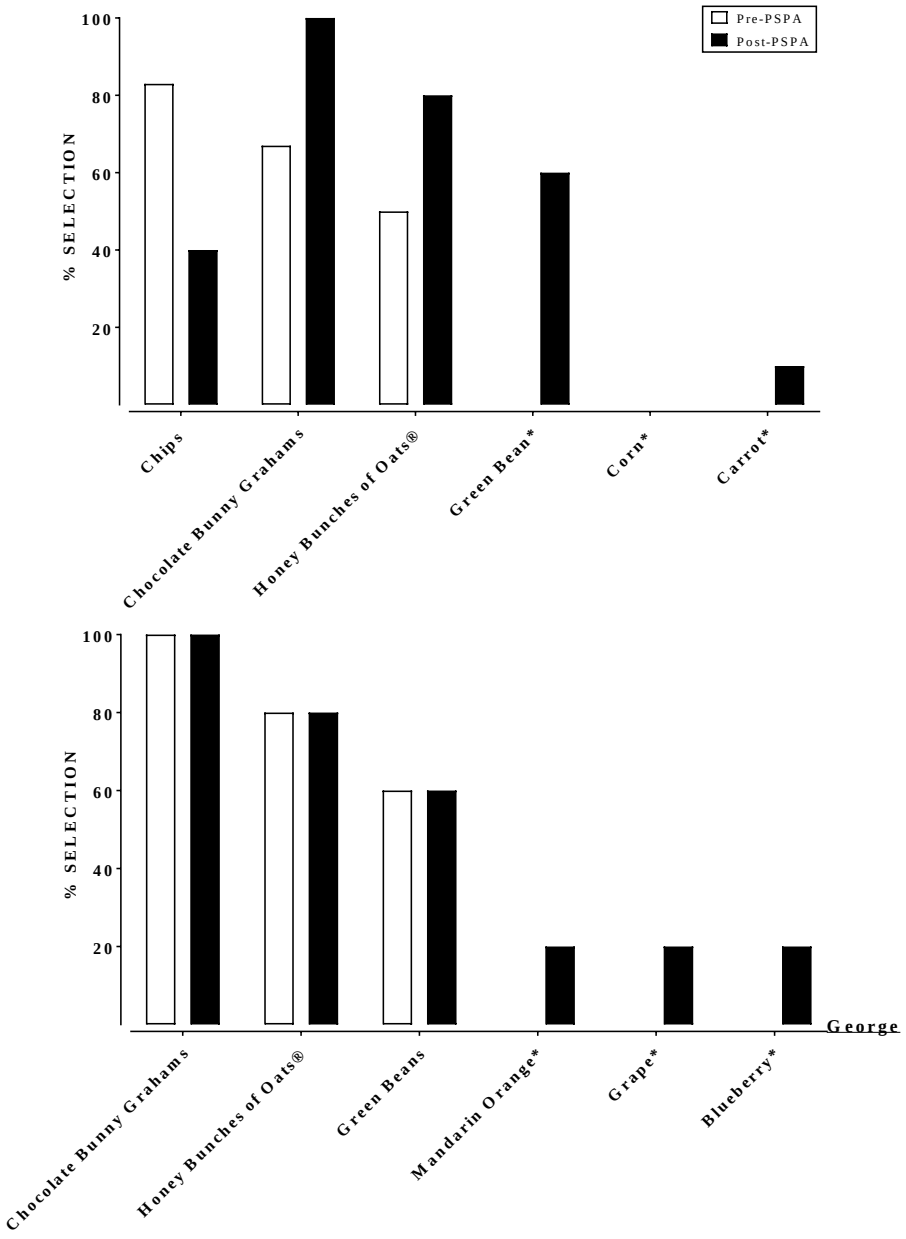


Figure 8. The percentage of trials George chose each of the food items during the pre-treatment PSPA (open bars) and post-treatment PSPA (closed bars) for the first (top panel) and second (bottom panel) treatment evaluation. The asterisks denote the non-preferred foods targeted for treatment.

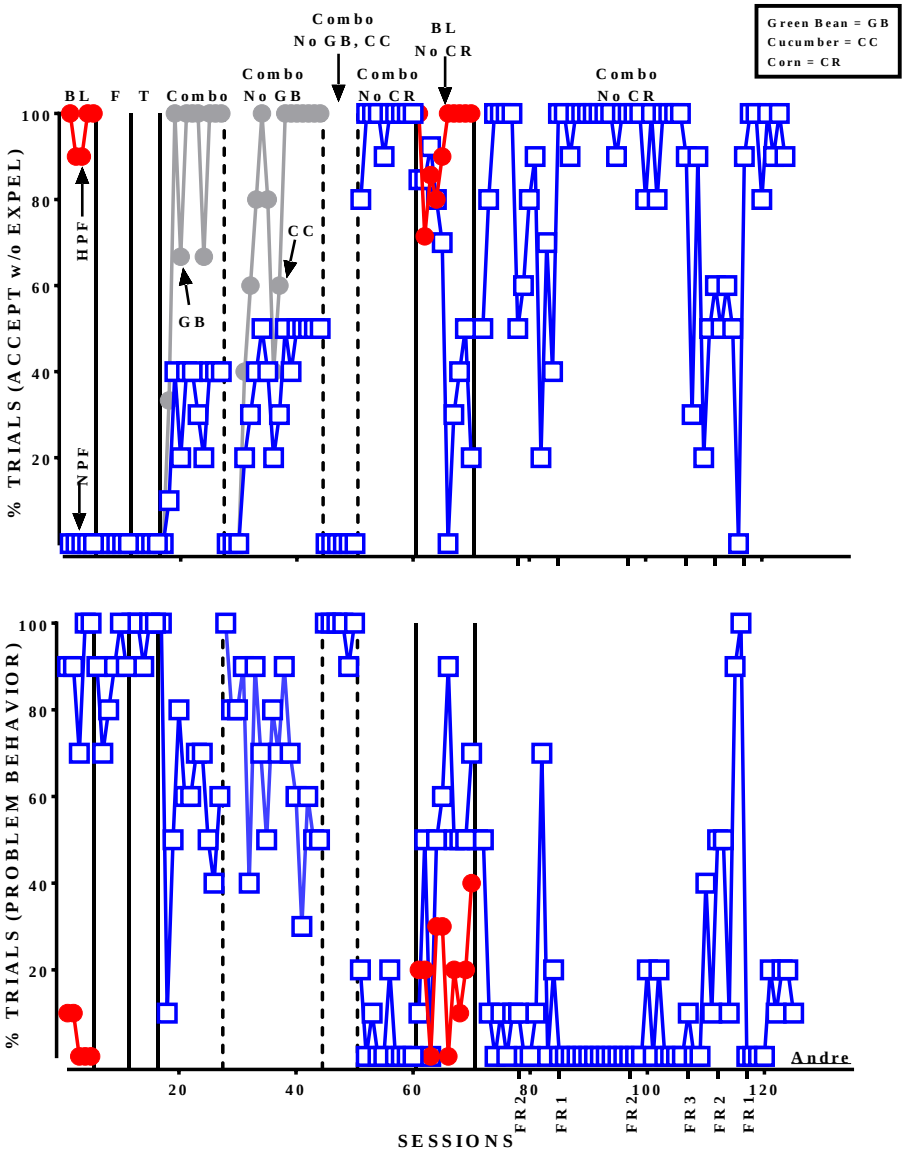


Figure 9. Andre's percentage of trials with acceptance without expulsion (top panel) and problem behavior (bottom panel). The closed red data path depicts trials with high-preferred food (HPF), the open blue data path depicts trials with non-preferred foods (NPF), and the closed gray data path depicts trials with one NPF food. Baseline is denoted by BL, SEQ (F) by F, SEQ (T) by T, SEQ (A) by A, and SEQ (combo) by Combo. The ticks on the bottom x-axis depict schedule of reinforcement changes (to fixed-ratio 1 [FR1], fixed-ratio 2 [FR2], and fixed-ratio 3 [FR3] schedules).

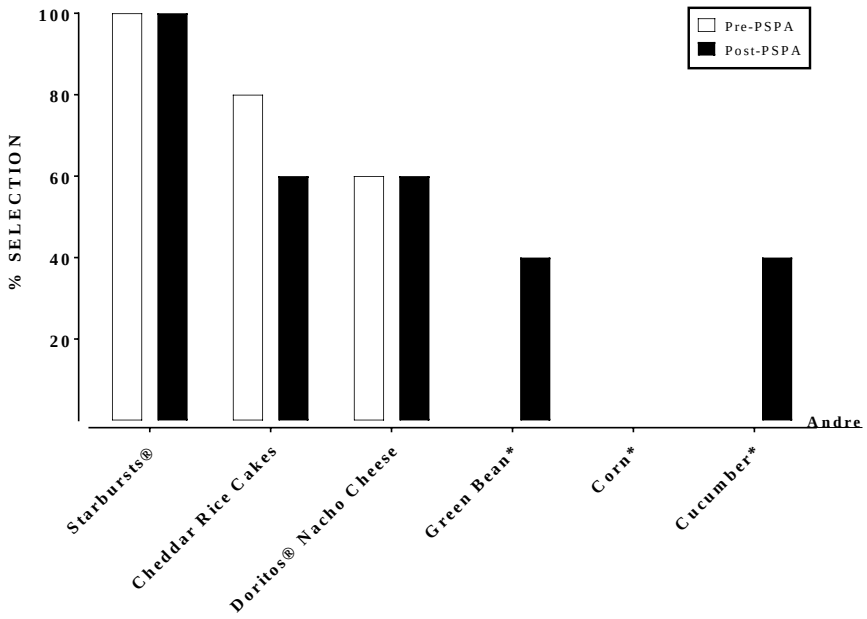


Figure 10. The percentage of trials Andre chose each of the food items during the pre-treatment PSPA (open bars) and post-treatment PSPA (closed bars) for the treatment evaluation. The asterisks denote the non-preferred foods targeted for treatment.

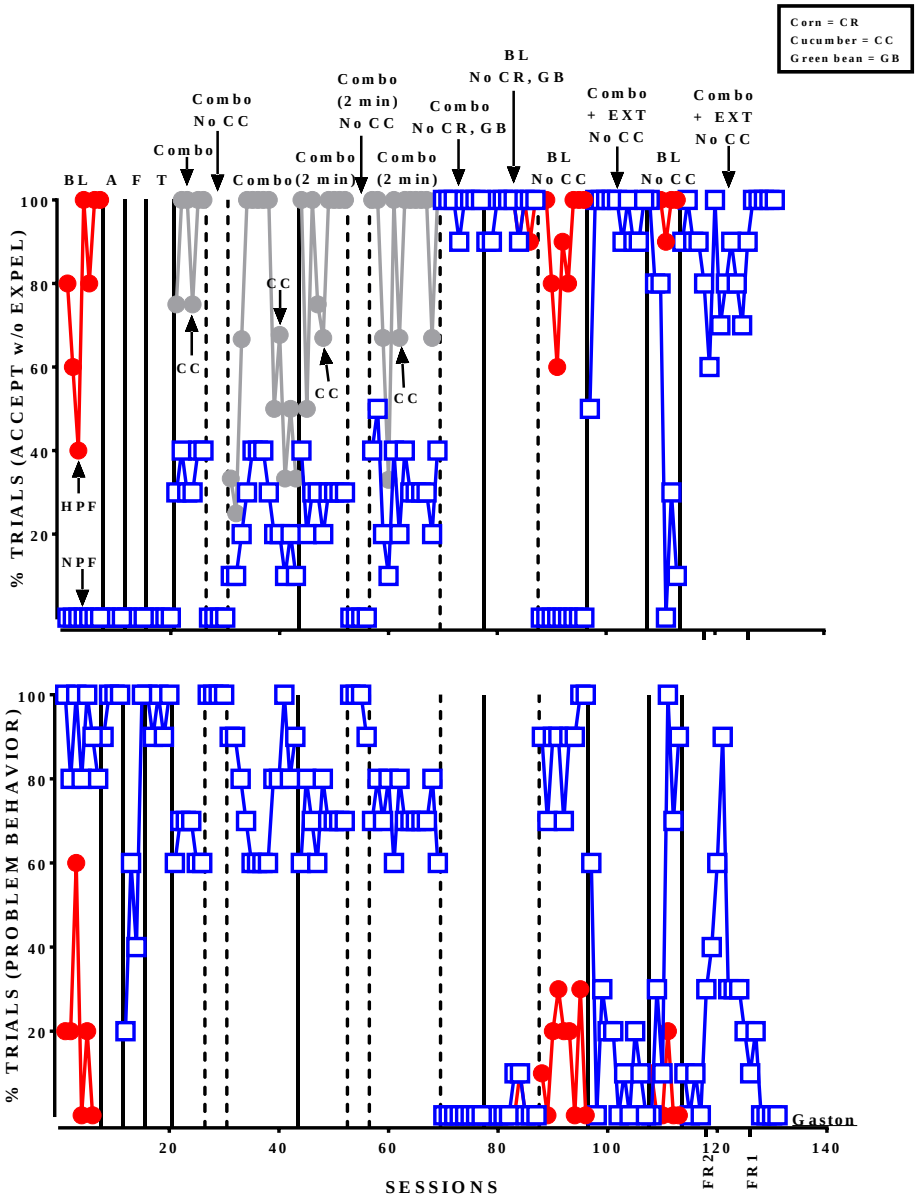


Figure 11. Gaston's percentage of trials with acceptance without expulsion (top panel) and problem behavior (bottom panel). The closed red data path depicts trials with high-preferred food (HPF), the open blue data path depicts trials with non-preferred foods (NPF), and the closed gray data path depicts trials with one NPF food. Baseline is denoted by BL, SEQ (F) by F, SEQ (T) by T, SEQ (A) by A, SEQ (combo) by Combo, SEQ (combo – 2 min) by Combo (2 min), and SEQ (combo) + EXT by Combo + EXT. The ticks on the bottom x-axis depict schedule of reinforcement changes (to fixed-ratio 1 [FR1] and fixed-ratio 2 [FR2] schedules).

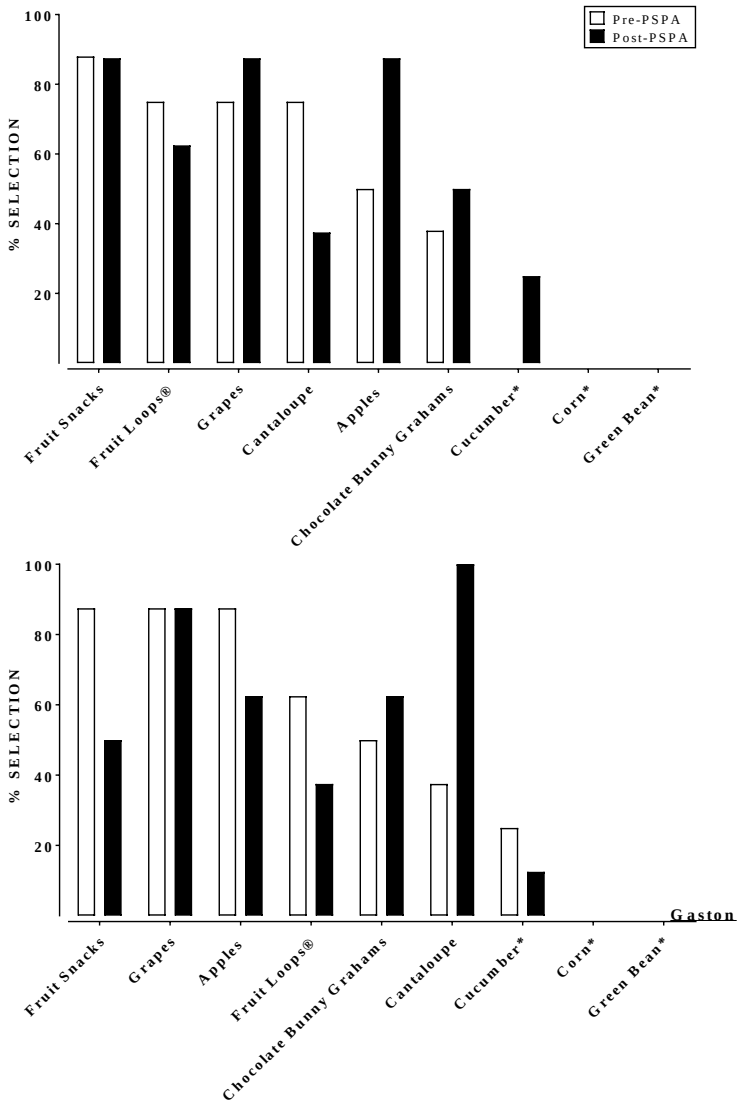


Figure 12. The percentage of trials Gaston chose each of the food items during the pre-treatment PSPA (open bars) and post-treatment PSPA (closed bars) for the first (top panel) and second (bottom panel) treatment evaluation. The asterisks denote the non-preferred foods targeted for treatment.

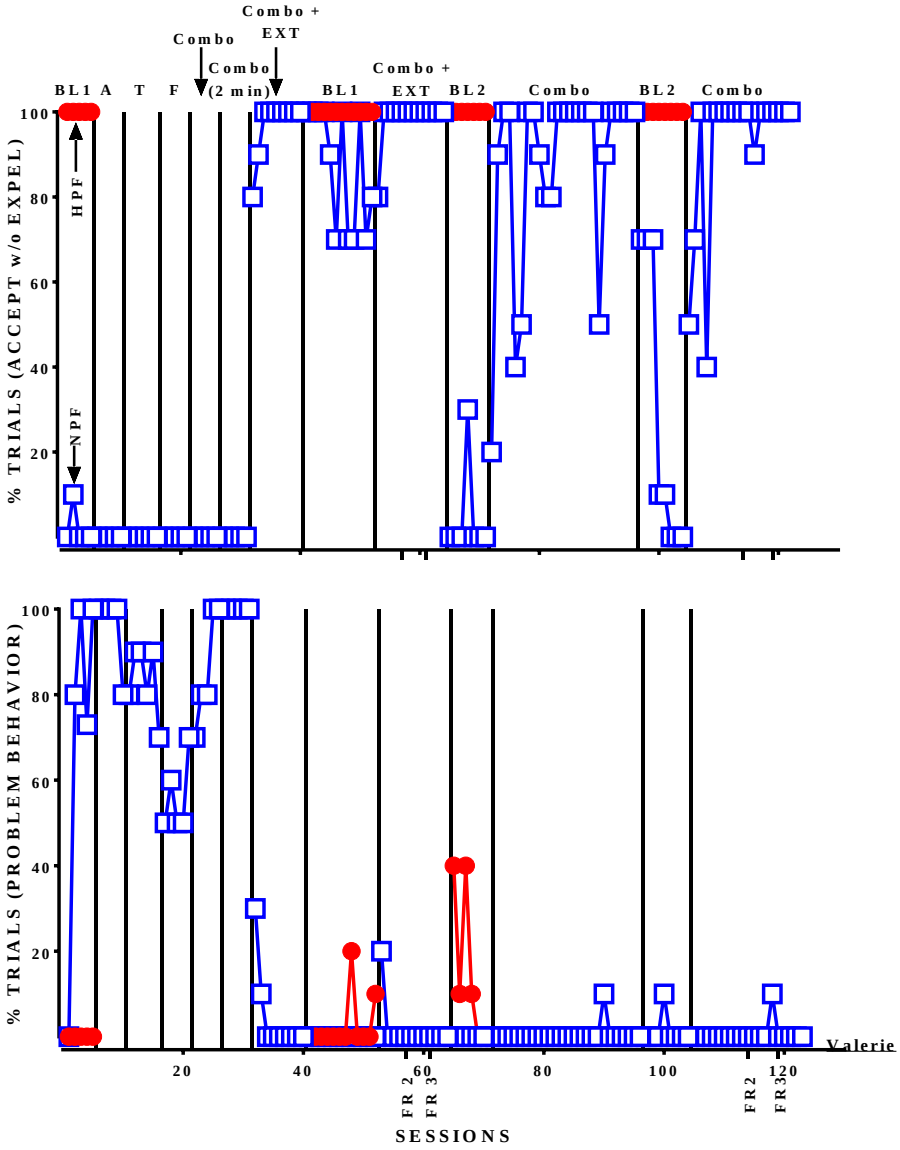


Figure 13. Valerie's percentage of trials with acceptance without expulsion (top panel) and problem behavior (bottom panel). The closed red data path depicts trials with high-preferred food (HPF), and the open blue data path depicts trials with non-preferred foods (NPF). Baseline is denoted by BL, SEQ (F) by F, SEQ (T) by T, SEQ (A) by A, SEQ (combo) by Combo, SEQ (combo – 2 min) by Combo (2 min), and SEQ (combo) + EXT by Combo + EXT. The ticks on the bottom x-axis depict schedule of reinforcement changes (to fixed-ratio 2 [FR2] and fixed-ratio 3 [FR3] schedules).

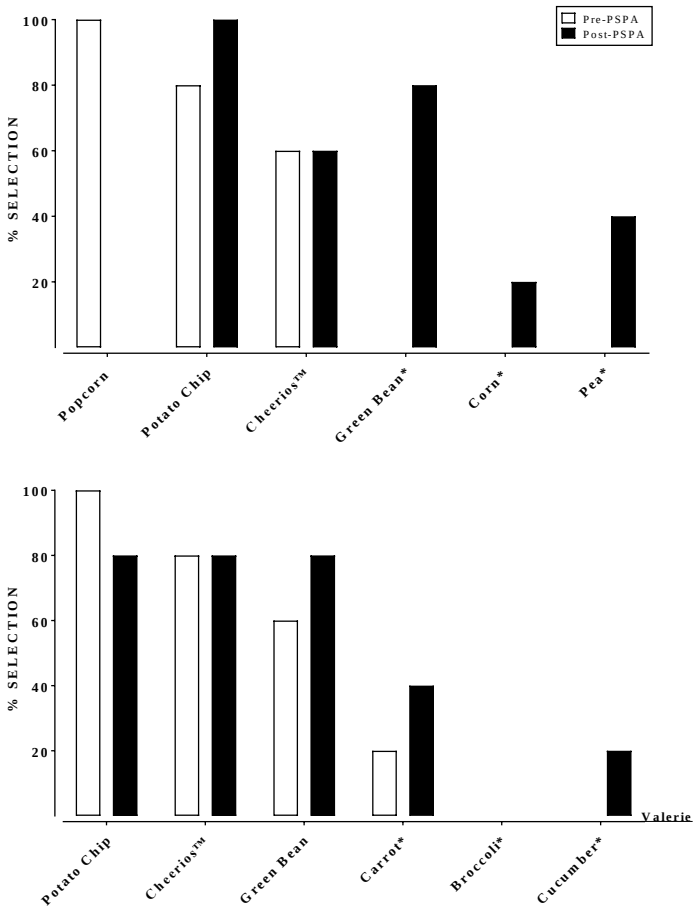


Figure 14. The percentage of trials Valerie chose each of the food items during the pre-treatment PSPA (open bars) and post-treatment PSPA (closed bars) for the first (top panel) and second (bottom panel) treatment evaluation. The asterisks denote the non-preferred foods targeted for treatment.

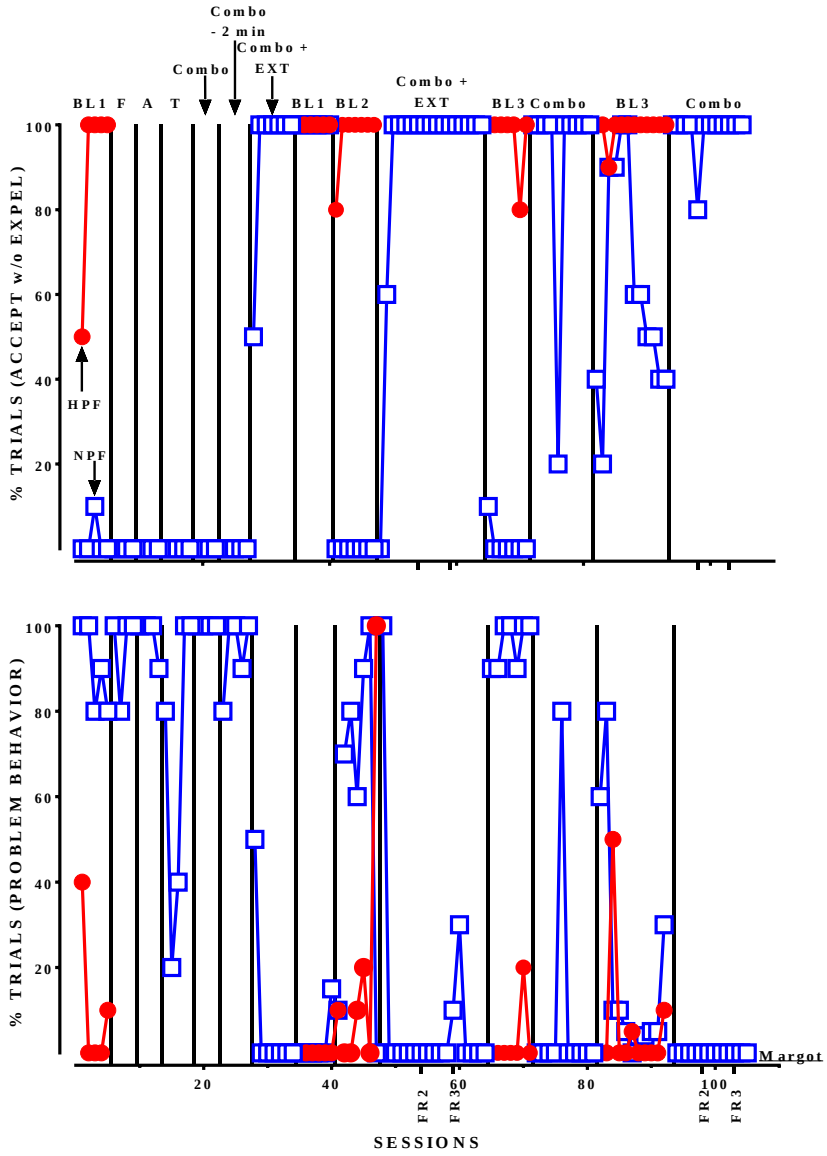


Figure 15. Margot's percentage of trials with acceptance without expulsion (top panel) and problem behavior (bottom panel). The closed red data path depicts trials with high-preferred food (HPF), and the open blue data path depicts trials with non-preferred foods (NPF). Baseline is denoted by BL, SEQ (F) by F, SEQ (T) by T, SEQ (A) by A, SEQ (combo) by Combo, SEQ (combo – 2 min) by Combo (2 min), and SEQ (combo) + EXT by Combo + EXT. The ticks on the bottom x-axis depict schedule of reinforcement changes (to fixed-ratio 2 [FR2] and fixed-ratio 3 [FR3] schedules).

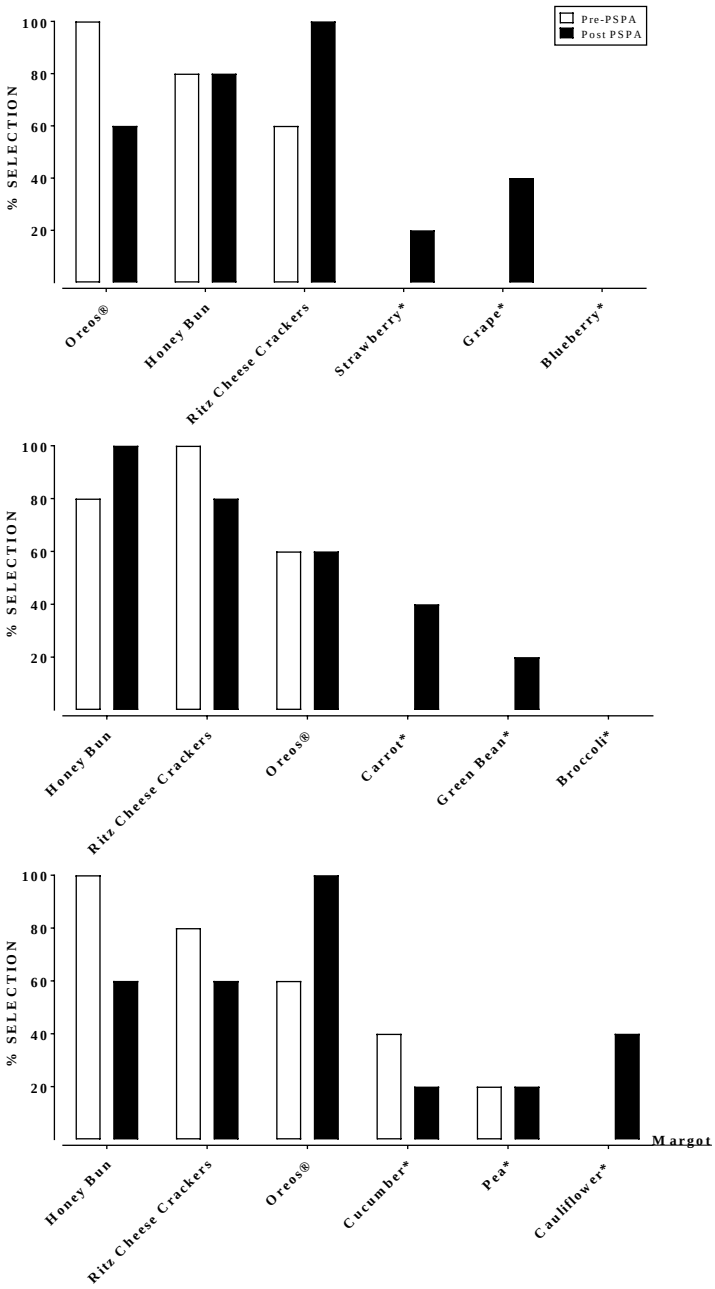


Figure 16. The percentage of trials Margot chose each of the food items during the pre-treatment PSPA (open bars) and post-treatment PSPA (closed bars) for the first (top panel), second (middle panel), and third (bottom panel) treatment evaluation. The asterisks denote the non-preferred foods targeted for treatment.

Appendix A

Informational letter that we distributed to caregivers to recruit participants.

Applied Behavioral Science
University of Kansas
Lawrence, KS 66045

Dear parent/guardian,

Does your child refuse to eat foods at home that you regularly serve? Does he or she refuse to eat some fruits or vegetables but will eat others? If so, you may be interested in having your child participate in the following study. We are interested in studying procedures to increase consumption of non-preferred foods (e.g., fruits, vegetables, meats) in children. Specifically, we are interested in evaluating a commonly used procedure to increase consumption of non-preferred foods. During this procedure, your child will be presented with a bite of non-preferred food. If your child accepts the non-preferred food, he or she will gain access to a high-preferred edible, toy, attention, or a combination of all three items. If your child does not accept the non-preferred food, the non-preferred food will be removed. If this procedure is ineffective, we will use this procedure; however, if your child refuses the food, the non-preferred food will not be removed.

This study may help your child directly in that we may increase consumption of foods that you commonly serve at home that he or she refuses to eat. If you are interested in having your child participate in this study or would like more information, please contact Jessica Juanico at jjuanico@ku.edu.

Thank you for your time,
Jessica F. Juanico

Jessica F. Juanico, M.A., BCBA, LBA – KS, MO
Graduate Teaching Assistant

Appendix B

BEHAVIORAL FEEDING ASSESSMENT

PARENT INTERVIEW

(adapted from Budd, 1998)

Date: _____ Location: _____ Interviewer: _____

DEMOGRAPHICS

Child: _____ B.D.: _____ Age: _____

Parent/Guardian(s):_____

Address: _____
_____
_____

Phone: _____

Mother:
Relationship to child (pick one):

Natural parent: _____ Other relative (describe): _____

Adoptive parent: _____ Other (describe): _____

Foster parent (how long?): _____

Age: _____ Ethnicity: _____

Total years of formal education (beginning with grade 1): _____

Occupation: _____

Number of hours worked per week: _____

Father:
Relationship to child (pick one):

Natural parent: _____ Other relative (describe): _____

Adoptive parent: _____ Other (describe):_____

Foster parent (how long?): _____

Age: _____ Ethnicity: _____

Total years of formal education (beginning with grade 1): _____

Occupation: _____

Number of hours worked per week: _____

General Developmental Background

Pregnancy/birth history:

_____

_____

_____

Health conditions/problems (inherited conditions, chronic conditions, medication, neuromuscular conditions, etc.):

_____

_____

_____

Illnesses, accidents, traumatic events, or hospitalizations (i.e., aversive conditioning history):

_____

_____

_____

Overall development (gross and fine motor, language, and social, etc.):

_____

_____

_____

Variations or stresses in day-to-day living conditions (moves, job changes, sibling births, serious illnesses in family, etc.):

_____

_____

_____

Feeding History

Medical restrictions on certain foods or liquids:

_____

_____

_____

Mealtime Habits

Favorite foods of the child:

_____

_____

_____

Foods and other liquids the child currently and regularly accepts:

_____

_____

_____

Check types child accepts:

_____ Fruits	_____ Meats	_____ Breads/cereals
_____ Vegetables	_____ Dairy Products	_____ Sweets/snacks

Check textures child accepts:

_____ Strained/pureed	_____ Chopped	_____ Crunchy
_____ Blended	_____ Crispy	_____ Regular
_____ Mashed	_____ Chewy	_____ Liquid

Foods and liquids child accepted at one time but no longer accepts:

_____

_____

_____

Foods and liquids child regularly rejects:

_____

_____

_____

Foods that you serve at home that you would like your child to eat:

_____

_____

_____

Person who regularly feeds child (e.g., mother, father, varies):

_____

_____

_____

Extent to which child feeds self (e.g., uses fingers, form) for preferred/non-preferred foods:

_____

_____

_____

Typical sequence in which food is offered (e.g., liquids last, preferred foods first):

_____

_____

_____

Best description of child's appetite (e.g., poor, variable, strong):

_____

_____

_____

Current Feeding Problems (mark all that apply)

_____ Eats too fast	_____ Eats too little	_____ Eats too slow
_____ Eats too much	_____ Fails to chew food	_____ Pushes food away
_____ Vomits or gags	_____ Fails to suck	_____ Spits food out
_____ Refuses to open mouth	_____ Throws or drops food	_____ Takes food from others
_____ Drools	_____ Cries or tantrums	_____ Turns away from spoon
_____ Messy eater	_____ Plays with food	_____ Refuses to swallow food
_____ Leaves table	_____ Finicky eater	_____ Eats non-food items
_____ Ruminates	_____ Sneaks or steals food	_____ Other: _____ _____ _____ _____

Feeding Techniques

Techniques currently used during meals (mark all that apply):

_____ Coax	_____ Forced feeding	_____ Ignore
_____ Threaten	_____ Change foods offered	_____ Model
_____ Offer reward	_____ Distract with play/toys	_____ Spank
_____ Send in room/time-out	_____ Change meal schedule	_____ Praise
_____ Limit foods	_____ Mini-meals	_____ Use TV

Other/explain:

_____

_____

_____

Feeding environment used most often for meals (mark all that apply):

_____ Lap	_____ Booster seat	_____ Floor
_____ Infant Seat:	_____ Table/Chair	_____ Couch
_____ High chair	_____ Stand/roam	_____ Other

Treatment Plans

Parents' priorities regarding feeding:

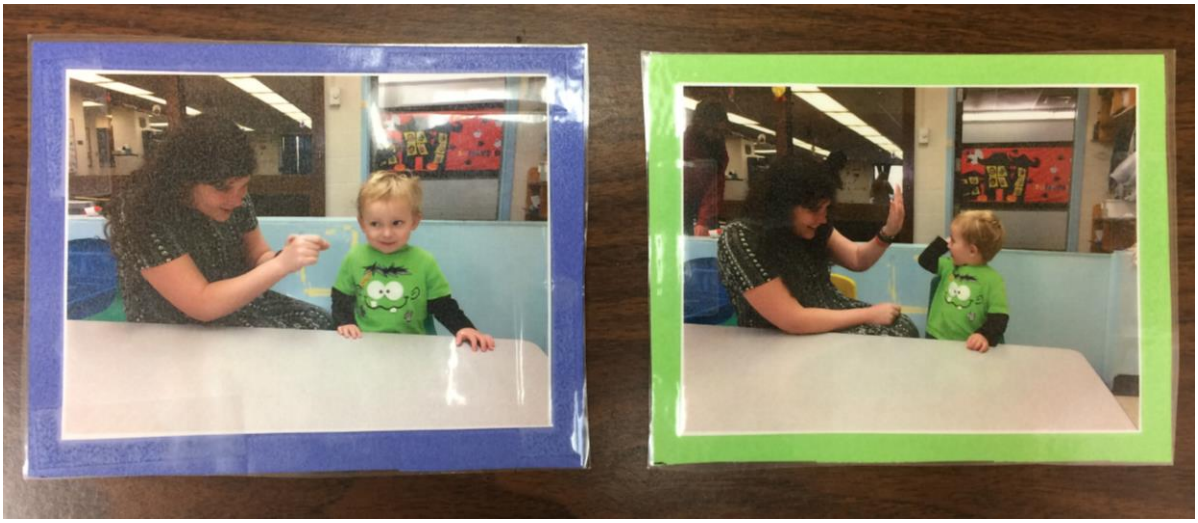
_____

_____

_____

Appendix C

Example of attention topography pictures (singing and high fives) that we used during the attention PSPA.



Appendix D

Experimental preparation for SEQ (F).

Appendix E

Experimental preparation for SEQ (T).

Appendix F

Experimental preparation for SEQ (A).

Appendix G

Experimental preparation for SEQ (combo) and SEQ (combo) + EXT.

Appendix H

Experimental preparation for SEQ (combo – 2 min).

Appendix I

Food Selectivity Questionnaire

Date: _____

Child's Name: _____

Your Name: _____

Relationship to Child: _____

Please circle the number which best describes the extent to which you agree or disagree with each statement.

Ratings: 1- strongly disagree 2-disagree 3-somewhat agree 4-agree 5-strongly agree

My child is more likely to eat previously disliked foods.	1	2	3	4	5
My child is more likely to eat or try new foods.	1	2	3	4	5
There has been an associated decrease in problem behavior during meals.	1	2	3	4	5
There has been an associated decrease in whining and crying during meals.	1	2	3	4	5
I feel more comfortable taking my child to restaurants and social events.	1	2	3	4	5
Mealtimes have become more enjoyable.	1	2	3	4	5
I am satisfied with the changes I've seen in my child's eating behavior.	1	2	3	4	5
I noticed changes in my child's eating behavior at home during treatment.	1	2	3	4	5
I would like to implement these procedures during mealtimes at home.	1	2	3	4	5
I would recommend this treatment to other parents.	1	2	3	4	5

Please provide any additional comments, fun stories, or positive outcomes that you have experienced from this study:

Please provide any additional comments, concerns, or negative outcomes that you have experienced from this study: